University of the State of New York

Regents' Bulletin

No. 5 April 1891

ACADEMIC SYLLABUS

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UNIVERSITY OF THE STATE OF NEW YORK
1893

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PREFATORY NOTE

Edition of 1880.— The first summary statement of the requirements for the examinations conducted by the University was prepared by Dr David Murray in 1880, and published in the form of a pamphlet of 28 pages, including 36 branches.

Edition of 1882.—The syllabus of 1882 was a revision and extension of the summary statement of 1880. It was prepared by Dr David Murray with the assistance of a committee appointed by the Convocation. The requirements for the examinations embraced 38 branches, the pamphlet of 91 pages including also a sketch of the system of examinations, the general regulations, a description of Regents' credentials, schedules of study and a list of the terms of admission to New York colleges.

Edition of 1888.— The edition of 1888 was a revision and extension of the syllabus of 1882. It was prepared by Dr Albert B. Watkins with the assistance of a committee appointed by the Convocation and with suggestions from principals and teachers. The requirements, as given in this third edition, embraced 42 branches, the pamphlet of 96 pages including in addition a sketch of the system of examinations, the general regulations, a description of Regents' credentials, and schedules of study.

Edition of 1891.— The present syllabus is a revision and extension of the edition issued in 1888. It was edited by James Russell Parsons, jr, under the direction of Dr Albert B. Watkins with suggestions from many principals and teachers. This fourth edition contains a syllabus of the subjects in which regular examinations are now held to meet the varying needs of the academies of the state. These subjects have been divided into 62 branches, 34 of which are required for the English and classical diplomas. The other matter included in the editions of 1882 and 1888 has been published separately.

As a result of many suggestions and criticisms from prominent educators and teachers, some important changes have been made in the quality and quantity of the work required for the examinations in the syllabus of 1888. The most notable of these changes are indicated below :

1 **Methods of study.**— The introductions, added by way of indicating the methods in which the various studies should be pursued to insure success in the examinations, have been made more complete.

2 **English.**— Elementary English and advanced English have been substituted for English grammar ; English composition and rhetoric, for rhetoric. Elementary English and English composition are practical courses in language designed to insure skill in oral and written expression of thought. They are intended for those not having time or inclination to study technical grammar and the science of rhetoric which are also kept on the list. American literature, as distinct from English, and a course in English reading have also been introduced. A new credential known as the English diploma is given for the successful completion of a fixed course in which special attention is paid to English. In response to a clear demand, every encouragement is offered to schools wishing to teach English more practically and thoroughly than heretofore.

3 **German and French.**— A three years' course in French and German, with an examination at the close of each year,

has been provided for those who wish to acquire proficiency in these modern languages. The aim of the course is to familiarize the student with the spirit of the two languages by reading at sight, repetition from memory, conversation, exercises in reproduction and composition.

4 **Latin and Greek.**— Examinations have been established for those who may not study Latin or Greek after the first year and for those who prefer to take a separate examination in Cæsar or the Anabasis. Ovid's Metamorphoses are now included among the Latin works on which examinations are held.

5 **Mathematics.**— A course in advanced arithmetic has been added to meet the requirements for admission to the normal schools and for the benefit of those who desire to pursue this study more thoroughly than the preliminary examination demands.

6 **Physical science.**— The general plan of the course in physics has been modified. Instead of attempting to cover the whole field at each examination, the elementary physics now embraces the first half of the subject and the advanced physics, the second half. The whole course is designed to represent one year's work. After careful and thorough discussion, it seemed better to make this division rather than to attempt to skim over the whole subject twice in one year.

In chemistry the same plan has been followed. A course in advanced chemistry has been added, the elementary chemistry embracing the first half of the subject, the advanced chemistry, the second half.

7 **General history.**— General history is now included among the subjects in which examinations are held.

8 **Drawing.**— An elementary examination in form-study and drawing, based on the course adopted by the Department of Public Instruction, is required for the 20-count certificate known as the *junior academic.* This change gives recognition early in the academic course to a subject which should be taught in all the elementary schools of the state.

9 **General character of the examinations.**— Much has been said and written of late against systems of examinations both at home and abroad. The London Times recently made the assertion that a phonograph, if properly managed, would carry off all the honors at the English schools and would be graduated by the universities as a "*double first.*"

There will always be foundation for such statements while examinations are mere tests of memory with no call for the exercise of reason, judgment and common sense. If properly conducted, however, examinations are the best means yet devised to protect our schools from incompetency.

In the examinations under the University, it is the aim to test as far as practicable the *thought-power* of the candidates. Definitions, rules, principles and laws are of little value without a knowledge of their applications. The question papers are framed to require this knowledge.

The language courses form an apparent exception to this rule in requiring the repetition of short selections from memory. Experience has demonstrated, however, the practical value of this plan in familiarizing students with the spirit of a language and in the cultivation of style.

It will be impossible for the University even to approximate the standard aimed at without the hearty cooperation of all persons interested in the work. The criticisms and suggestions of principals and teachers have done much in the past to improve the character of these examinations. The only criticisms which it is desirable to avoid come from persons who will not take the trouble to examine into that which they ignorantly condemn. Intelligent criticisms and suggestions are earnestly requested and will always meet with careful consideration.

Regents' Bulletin

No. 5 April 1891

SYLLABUS OF SUBJECTS IN WHICH REGULAR EXAMINATIONS ARE HELD IN ACADEMIES

The detailed syllabus which is given below has been prepared with the view of indicating more definitely the scope and character of the examinations in the several subjects. It is hoped that in this way the diversity in preparation which tends to arise from the use of different text-books, and from the different methods of instruction, may be obviated. It is not the design to interfere with that freedom and flexibility which ought to exist in a system of instruction so extended as that conducted in the academies of the state; but only to specify, with such exactness as may be practicable, the subjects and the extent in each subject for which the candidates in these examinations will be held responsible. It is to be understood that *the restrictions laid down in the syllabus are intended as well for those who prepare and issue the questions as for those who are to be called on to answer them.* It is purposed in the preparation of these questions to keep in view what may fairly be expected from students in academies, and not to go beyond what their age and opportunities will warrant. It will be expected, however, that the instruction in the various subjects of examination will be kept up with the advances made in them. The deficiencies of particular text-books must not be pleaded in extenuation of inadequate knowledge, but must be supplemented by the enterprise of the teacher. In many subjects new discoveries of the greatest interest and importance are being made constantly, and it is the duty of the teachers to bring these to the attention of their classes. Thus, the new discoveries in electric science, and the improvements resulting from them in the transmission of news and in artificial illumination and in locomotion, although not found in many of the text-books, are still, as far as they can be properly taught in academies, regarded as legitimate subjects for examination. So, too, it will be expected that teachers will keep their scholars informed of the important movements among the nations, by which political and territorial changes are brought about.

For convenience in explaining the requirements for examination in the various subjects, they are arranged in groups according to their cognate relations and not in the order of the courses of study. The subjects included in these groups, printed on p. 160, do not form a list of academic studies proper, but a complete table of *all* branches in which regular examinations are now held to meet the varying needs of the academies of the state. The appearance of so many subjects on this list should not be made an excuse for overcrowding the high school curriculum. Principals should not form classes in advanced subjects with immature pupils, nor should they confuse with the regular high school course, subjects in which examinations are held or instruction is given for advanced or special students or those pursuing university extension courses.

The right is reserved to withdraw from the list of examinations offered, any subject in which less than 10 schools have given instruction during the previous year, but notice of such withdrawal will be sent to every school on or before the opening of the academic year on August 1.

GROUP I

LANGUAGE AND LITERATURE

ENGLISH LANGUAGE AND LITERATURE

Reading
Writing
Spelling
Elementary English
English composition
Advanced English
Rhetoric
English literature
American literature
Course in English reading

The objects to be attained in these courses in the English language and its literature are skill in oral and written expression of thought, and the cultivation of a taste for good reading.

Short poems, prose and poetic selections from standard English or American authors, suitable for memorizing and announced previous to the examinations, are required in all English branches except reading, writing and spelling. These selections will be made with special regard to the stimulation and perpetuation of patriotic sentiment.

In the elementary English, English composition, advanced English and rhetoric courses, systematic instruction should be given in the critical study of words from the dictionary and other books of reference.

The courses in elementary English and English composition are designed to give a mastery of the mother-tongue, sufficient for the ordinary purposes of intelligent citizens. The course in advanced English is devoted particularly to the science of grammar, including an outline of the history of the English language. The courses in rhetoric and English and American literature are planned to give the student a familiarity with the canons of criticism which will enable him to appreciate and pass an intelligent judgment on the merits of the great masterpieces of the literature of the English tongue.

Reading.— In order that due attention to reading may be secured, it is included among the subjects required for a preliminary certificate. Teachers should always bear in mind the importance of reading as an introduction to the intelligent study of English literature. They should endeavor to impress on the minds of their pupils the fact that the English language embraces some of the best literature of the world. They should spare no pains in their endeavors to encourage a taste for good reading. Patriotic selections and accounts of heroic deeds are particularly valuable in that, while exciting interest, they tend to cultivate a national spirit and a love of our free institutions.

As reading is a subject to which the usual examination tests are inapplicable, it is required that the principal examine and report on all candidates for the preliminary certificate, in accordance with the following regulations and suggestions:

1 **Regulations and suggestions.**— The general standard of proficiency required is the ability to read ordinary prose correctly, and with such clearness, force and propriety that the author's meaning and intention shall be conveyed by the reader to all present as hearers. Among the essential requisites for such a style of reading there must be distinct articulation, correct and ready pronunciation, the intelligent perception by the reader of the author's meaning, and its oral reproduction in a natural, agreeable and effective manner. Such proficiency will seldom be attained, except as the result of careful training and much practice.

In order to ascertain the general proficiency of the candidates, it is recommended that the principal, early in each term, appoint and hold, either in person or by a competent assistant, a special exercise in reading. This exercise should be conducted. by assigning one or more paragraphs to each candidate to be read at first sight, with the other candidates and the teacher as listeners at suitable distance from the reader. Each performance should be carefully estimated and marked on a scale of 100, and this record should be preserved for future reference. The candidates should then be organized into a class for such further instruction and regular practice as may be practicable and necessary.

The regular final examination in reading is to be held in the same general manner as that already indicated for the first trial exercise on any convenient day or evening before the close of the examination in other preliminary subjects. The passages should be such as have not been before read by the candidates. To insure freshness of subject-matter, current topics as presented in newspapers, magazines or newly published books should be selected for these exercises. The test for each candidate should be prolonged until the principal is satisfied whether or not the required proficiency of 75 on a scale of 100 can be reported.

Writing.—Writing will hereafter be included among the subjects required for a preliminary certificate and the number of credits of each candidate who passes, estimated on a scale of 100, is to be reported by the principal. The candidate's own handwriting in the essay required in the elementary English paper, or in a dictation exercise sent with the examination paper, or, if preferred, any other of his papers, may be used for this purpose. A separate paper of at least one page may be submitted for this test if the following certificate is signed by the candidate at the close of the paper: "I certify that the above page was written by me without previous practice on the sentences written." "Claimed in writing —— per cent" should be written in red at the top of the last page of the paper under the candidate's name. The principal is directed to mark the papers in handwriting according to their neatness and legibility.

Spelling.—The one hundred words selected for this test exercise are intended to be a fair specimen group of such as are commonly used in current literature, and at the same time are liable to be misspelled by persons not duly proficient in orthography. A few proper names are included, with the requirement that the initial letter of each be written with a capital. Any varieties of spelling authorized by recognized authorities are allowed.

Elementary English.— The instruction given in this course should be practical, with special attention to exercises in dictation, reproduction, ordinary business forms, letter-writing and elementary composition.

The examination includes:

1 **General topics.**— The common uses of capital letters, diacritical and punctuation marks and abbreviations; parts of speech; declension; the formation of plurals and possessives; distinctions of gender; comparison; classification of verbs; an elementary knowledge of the syntax of words; sentence-building; classification of sentences according to use and form; analysis of easy sentences under the above classification.

2 **Prefixes and suffixes.**—The derivation of words with meanings of the following common prefixes and suffixes:

A or *ab* — from; *ad* [*ac, ag, al, am, an, ap, ar, as, at*] — to, toward; *circum* — around; *con* [*co, col, com, cor*] — with, together; *e* or *ex* [*ef*] — out; *in* [*il, im, ir*]— in, into; *in* [*ig, il, im, ir*] — not; *ob* [*of*] — against; *per* — through; *post* — after; *pre* — before; *re* [*red*] — back; *sub* [*suc, suf, sug, sup, sur, sus*] — under, after.

Able [*ible, ble*]; *dom; ed; en; ent; er; est; ful; fy; ing; ion; ish; ist* [*st*]; *less; let; ling; ly; ness; or; ship; some; y* [*ie*].

3 **Stems.** — A knowledge of the meanings of the following familiar stems and the application of those meanings in the formation and definition of the more common words containing them:

ag
alt
anim–mind
ann
apt
bas
brev
cad
capt
carn
ced
cent

cing
clin
cor
cur
curr
dict
dign
duc
equ–equal
fa
fact
fer–bear
fid
fin
frang
fus–melt
gener
grad
graph
grat
hospit
ject
junct
jur
lat–carry
leg–send
lect–gather, choose
liber–free
lin–flax
liter
loc
log
loqu
lud
magn
man–hand
mar
mater
medi
ment
merc
merg
meter
migr
mir
mitt
mon–advise
mort
mot
mult
mun
nat–born
nav
not–known
numer
nunci
ocul
par–get ready
parl
part–divide
past
pass–suffer
pater
ped–foot
pell–drive
pend
pet–ask
phil
plet
plic
pon
port–carry
port–gate
pos–place
prim
sacr
sci–know
scrib
sent
sequ
sol–alone
spec
spir
stru
sum
tact–touch
un
ut
vid
viv
voc

4 **Practical exercises.**— Letter-writing and common business forms; dictation and reproduction of easy selections from standard authors; an essay on a topic given in the examination paper, taken from some author previously announced, to consist of at least 100 words, and to be credited in proportion to its excellence in spelling, penmanship,

punctuation, capitalization, general neatness, grammatical construction and proper use of words.

English composition.—This examination presupposes a mastery of the mother-tongue, sufficient for the ordinary purposes of intelligent citizens. Instruction should be closely related to the study of literature. The student is expected to have a general knowledge of the varieties of composition in both prose and poetry.

1 **Sentence.**— Capitalization; punctuation, grammatical classification according to form and use; changing of sentences from one kind to another; short and long sentences; loose and periodic sentences; balanced sentences; places of emphasis in the sentence; the unity of the sentence; expansion of words into phrases, of phrases into clauses; contraction of sentences into phrases and single words, and of two or more sentences into one.

2 **Paragraph.**— Uses of the paragraph; requisites in its construction; combination of miscellaneous sentences into paragraphs.

3 **Prose composition.**— Common business forms and the principal varieties of letter-writing; writing from dictation and exercises in the reproduction of selections from standard works in prose and poetry; transformation of poetry into prose; a reasonable degree of skill should be shown in discriminating between ordinary synonyms and in the correction of common errors in the use of English, such as *shall* for *will*, *would* for *should*, *can* for *may*, *sit* for *set*, *lie* for *lay*, *such* for *so*, *except* for *without* or *unless*, *like* for *as*, *in* for *into*, *beside* for *besides*, *between* for *among*, etc.

4 **Theme.**— Its form or outline, introduction, discussion, conclusion; its kind, narrative, descriptive, persuasive or argumentative.

An essay is required at each examination on a topic given in the examination paper, taken from the work of some author previously announced. This essay should consist of at least 200 words, and will be credited in proportion to its excellence in capitalization, punctuation, spelling, general neatness, precision, clearness, proper use of words and logical sequence of ideas.

Advanced English.— In this course, particular attention is paid to grammar as a science. The student is required, in the examination, to show his ability to analyze, parse and criticise. The course includes also an outline of the history of the English language, with special reference to its origin and growth as affected by the Roman, Anglo-Saxon and Norman conquests. The student should learn to select words containing Latin, Saxon or Greek elements.

The examination also embraces:

1 **Etymology and syntax.**— The general principles of etymology and syntax; correction of sentences grammatically incorrect, with reasons; parsing and analysis of sentences; thorough knowledge of phrases and clauses.

2 **Prefixes and suffixes.**— The derivation of words with meanings of the prefixes and suffixes included in the elementary English course and the following in addition:

Amb [*ambi*]—around; *amphi*—on both sides; *an*—without, not; *ana*—back, again; *ant* [*anti*]—against; *ante*—before; *apo*—from, off; *be*—cause etc.; *bene*—well; *bi*—double, two; *bis*—twice; *cata*—down; *contra* [*contro, counter*]—against; *de*—down, from; *dia*—through; *dis* [*di*] apart; *du* [*duo*]—two; *epi*—upon; *eu*—well; *extra*—beyond; *hemi*—half; *inter*—between; *pen*—almost; *poly*—many; *pro*—before; *semi*—half; *super*—over; *sur*—over; *trans*—across.

Aceous [*acious*]; *acity* [*icity, ocity*]; *age; al; an* [*ane*]; *ance* [*ancy*]; *ant; ary; ate; ent; erly* [*ern*]; *ery* [*ry*]; *ic* [*ical*]; *ile; ine; ise* [*ize*]; *ism* [*sm*]; *ity* [*ty*]; *ment; mony; ory; ple; ry; tude.*

3 **Stems.**— A knowledge of the meanings of the following stems, in addition to those included in the elementary English course, and the application of those meanings in the definition of the more common words containing them:

aper
arch
art
aud
aur–gold
bat

bit
cant
capit
celer
commod
commun
coron
corpus
cred
cycl
dat
dent
di
domin
dorm
fac–face
felic
fess
form
fort
gest
gran
gross
hor
integr
judic
lingu
major
man–stay, dwell
medic
mens
pan
par–equal
pass–step
pen
petr
phon
physi
pict
plac
plen
plum
plumb
pot
potent
prehend
punct
quadr
quant
quer–seek, ask
quiet
radi
rap
rat
rect
reg
ris
riv
rog
rupt
sal–salt
sal–leap
sanct
sat
scop
sec
sen
serv
sist
son
sort–lot
speci
stant
stell
string
su
suad
surg
taill
tang
teg
tempor
tend
test–witness
tort
tract
trit
trud
und
vad
val–be strong
ven–come
vers
vi
vic
volv
vot

4 **Composition.**— An essay as in the elementary English examination, but to consist of at least 150 words.

Rhetoric.—The examination covers every important subject connected with rhetoric proper regarded both as a science and as an art. The science of rhetoric investigates, analyzes and defines the principles of good writing; the art of rhetoric teaches the application of these principles.

1 **Sentence.** — Rhetorical qualities of a sentence; short and long sentences; loose and periodic sentences; balanced sentences; places of emphasis in the sentence; the unity of the sentence.

2 **Paragraph.**— Uses of the paragraph; requisites in its construction.

3 **Subject or theme.**— Choice of a subject; collection of material,— by reading, conversation, observation, reflection; arrangement of material.

4 **Qualities of style.**—

Purity: Words as used by the best writers and speakers; words whose use is reputable, national, present; principles to guide when usage is divided.

Propriety: Avoidance of undignified expressions; words used in accepted signification; plain and figurative language.

Precision: Words used to convey exact meaning; derivation of English words, signification of prefixes and suffixes; use of synonyms; use of prepositions, of auxiliary verbs; tautology; redundancy.

Simplicity: In terms and in structure.

Clearness: As opposed to obscurity and vagueness; avoidance of ambiguous words or phrases; arrangement of words and clauses.

Strength: Arising from originality, harmony and variety; from brevity of statement; from allusions to elevated ideas and to the sublime in nature.

Pathos: Awakened by allusions to tender relationships; to acts of goodness; to humane sentiments; to human misery and human happiness.

The ludicrous: Derision; ridicule; sarcasm; raillery; jest humor; wit.

Melody: Dependent on the use of melodious letters; on a pleasing succession of syllables and words; on an agreeable cadence at the close of a sentence.

Harmony: Of sound and sense, arising from the use of words imitative of sounds; words imitative of motion; words imitative of bulk.

Taste: Growing out of the attention paid to the rules of good writing, and to the feelings and sensibilities of men.

5 **Figures of speech.**—

Based on the idea of resemblance.—

Simile: Dependent on comparison; the pleasure of tracing comparisons; characteristics of a pleasing simile.

Metaphor: Distinction from simile; effects on the mind; loss of figurative force; mixed metaphor; excess in the use of metaphor.

Personification: In what it consists; different degrees of personification; advantages of the English language for personification.

Based on contiguity or the law of association.—

Allegory: Its nature and distinctions; fable; parable.

Synecdoche: The species for the genus; an individual for the species; the genus for the species; the concrete for the abstract.

Metonymy: The sign used for the thing signified; the instrument for the agent; the container for the thing contained; an effect for the cause; an author for his works; the material for the thing made.

Hyperbole: Its nature; emotions which are the source of hyperbolic language; limitations to hyperbole.

Apostrophe: The absent addressed as present in place.

Vision: The past or future represented as present in time.

Based on the idea of contrast.—

Antithesis: Contrast of parts; the verbal construction required.

Epigram: Its distinctive characteristics; its effect in discourse; the pun a species of epigram.

Climax: Rising arrangement of the parts of a period.

Interrogation: An affirmation in the form of a question; the contrast of affirmative and negative answers.

Irony: The expression of the opposite of what is meant.

6 Kinds of discourse.—

Description: Combination of a clear plan with enumeration of mode of description; individualized description; aid derived from associated circumstances and from associated human feelings; scientific description; poetic description.

Narration: The elementary principles of a narrative style; order of events; concurring streams of events; value of summaries of events; historic composition; biography.

Exposition: Applications in various kinds of composition; how general propositions are to be enforced—by iteration; by contrast; by examples; by illustrative figures; by explanation of difficulties; by deductions and applications.

Oratory: The ends of oratory; classification of oratory; persuasion by description, narration and explanation; persuasion by argument; appeals to the feelings; the language of oratory; the demeanor of the orator.

Poetry: The materials of poetry drawn from external nature; from human life; from concrete rather than abstract notions; it demands harmony of style.

7 Versification.— Meter; dissyllabic measures; trisyllabic measures; verse; rhythm; rhyme; alliteration; blank verse; sonnet; Spenserian stanza; hymn stanzas; ballad meter.

8 Kinds of poetry.— *Lyric poetry,*— its characteristics; the song sacred and secular; the ode; the elegy; the sonnet. *Epic poetry,*— characteristics of the great epic, the romance, the tale, the ballad, the pastoral and the idyl. *Dramatic poetry,*— tragedy; comedy; the farce; the mask; the opera. *Didactic poetry,*— poems designed to instruct; satire, its character and objects.

English literature.— The course in English literature indicated below is suggested as best adapted to the age and opportunities of the candidates. It is chiefly confined to the great authors and is intended to lead to a good knowledge of some definite part of their works rather than to carry the student over the whole field of literature.

1 **Introduction.**— As introductory to the subject, students should be instructed in a brief outline history of the original Celtic people of England; of the invasion by the Romans; of the Saxon period and of the Norman conquest; and in the character of the language and literature of these periods. This can be best accomplished by making the study of English history precede that of English literature, directing special attention in the latter study to the early language and literature.

2 **Literature to the time of Shakspere.**— Of the literature down to the time of Shakspere students should acquire a general knowledge, and be able to give some account of the early authors and of the character and influence of their works, viz.: Alfred; the Venerable Bede; the chroniclers; Chaucer, the periods of his literary career and the plan of the Canterbury Tales; Wycliffe and the influence of his translation of the Bible on the English tongue; William Caxton and the first works printed in English; Sir Thomas More and the Utopia; William Tyndale, his translation of the Bible and its conservative influence on the language; Cranmer and the Book of Common Prayer; Edmund Spenser and a brief account of the Faery Queene; the miracle plays and moralities, and the gradual development of the drama.

3 **Literature from the time of Shakspere.**— It is expected that the candidates will acquire a good knowledge of the lives and characters of the great authors enumerated below; that they will read some specimen of their works — a complete specimen whenever possible — and be able to explain the general aim, character and influence of their writings. In addition, a general knowledge of the lives

and writings of the noted contemporaries of these authors will be required. The works enumerated under each author are recommended for reading.

Shakspere: His place in literature; his principal plays, under the three heads of histories, tragedies and comedies. Julius Cæsar, Hamlet, Tempest.

Francis Bacon: His character and career; the influence of his works on science and philosophy. Essays.

John Milton: His life and character; his principal prose and poetic works; his political sentiments and influence. Paradise Lost.

John Bunyan: His life and works; the nature and purpose of his allegories. Pilgrim's Progress.

John Dryden: His principal works. Ode on St Cecilia's Day.

Alexander Pope: Account of his classic translations; his satiric writings. Essay on Man.

Joseph Addison: His literary and political career; character of his prose and poetry. Cato.

Dean Swift: His eccentric character; his works. Gulliver's Travels.

Daniel Defoe: Robinson Crusoe.

Hume, Gibbon, Macaulay: The three historians; some account of their characters, careers and works.

Samuel Johnson: His principal works; his biography by Boswell; his dictionary. Rasselas.

Oliver Goldsmith: His prose and poetic works. Vicar of Wakefield, Deserted Village.

Robert Burns: Influence and popularity of his works. Cotter's Saturday Night.

Walter Scott: As poet and prose writer; account of his fictions. Lady of the Lake.

Byron: His life and works. Childe Harold.

William Wordsworth: The Lake school of poets. Excursion.

Coleridge: His character and influence. Ancient Mariner.

Thackeray, Dickens: Their best works; their distinguishing characteristics; the influence of their writings.

Tennyson: Idyls of the King.

4 **Special studies in English literature.**— In addition to the general study of the great authors above enumerated, which will be presumed in every candidate at each of the trials, it is proposed to include in each examination a special study of some single work of which notice will be given in advance. The questions on such work will cover its plan, its object and its literary merits. In addition to an accurate knowledge of its contents, students should commit a few choice selections to memory. The works enumerated below or others to be announced hereafter will be used for this purpose:

Shakspere: Hamlet, Julius Cæsar, Tempest, Macbeth, As You Like It.

Bacon: Essay on Truth, or Wisdom of the Ancients.

Milton: First two books of Paradise Lost, or Comus.

Dryden: Ode on St Cecilia's Day.

Goldsmith: Deserted Village, Vicar of Wakefield.

Bunyan: Pilgrim's Progress.

Coleridge: Ancient Mariner.

Scott: Lady of the Lake.

Macaulay: Essays on Milton and Addison.

American literature.— This course follows the general plan of that in English literature in being confined chiefly to those American writers who are recognized as the greatest. Candidates will be expected to show a high degree of familiarity with the best of our national anthems, popular poems and patriotic selections.

As a further guide to indicate the quality of the preparation needed, the following summary has been prepared:

1 **Colonial and revolutionary periods.** — The candidate should have studied a brief outline history of American literature in the colonial and revolutionary periods. He should have a knowledge of the general character of the writings of these periods and should be able to give

some account of the more prominent authors, such as Roger Williams, Increase and Cotton Mather, Jonathan Edwards, Benjamin Franklin, David Ramsay, Alexander Hamilton.

2 Literature of the nineteenth century.— The candidate should have a general knowledge of the lives and works of such authors of the nineteenth century as Richard Henry Dana, Jared Sparks, Mrs Sigourney, N. P. Willis, Theodore Parker, Margaret Fuller, John G. Saxe, Henry D. Thoreau, Edwin P. Whipple, Richard Grant White, Bayard Taylor, Helen Jackson, etc. He should be thoroughly familiar with such popular poems as the following:

Clement Clarke Moore: St Nicholas.
John Pierpont: Warren's Address.
Samuel Woodworth: Old Oaken Bucket.
Fitz-Greene Halleck: Marco Bozzaris.
George P. Morris: Woodman, spare that Tree.
Thomas Buchanan Read: Sheridan's Ride.
Francis Miles Finch: Nathan Hale.

The examination will require a reasonable degree of familiarity with such authors of the day as Donald G. Mitchell, Edward E. Hale, George William Curtis, Lew Wallace, John T. Trowbridge, Charles Dudley Warner, Edmund C. Stedman, S. L. Clemens, T. B. Aldrich, W. D. Howells, Frances Hodgson Burnett, F. Marion Crawford, etc.

The examination will presuppose that, in the courses in reading, elementary English, English composition and rhetoric, candidates have committed to memory the choicest of our national anthems, popular songs and patriotic selections. The following are mentioned as worthy of this special study and candidates will be expected to write from memory one or more of these pieces or others to be announced hereafter:

Joseph Hopkinson: Hail, Columbia, Happy Land!
Francis S. Key: Star-Spangled Banner.
John Howard Payne: Home, Sweet Home.

Ralph Waldo Emerson: Concord Hymn.

Oliver Wendell Holmes: Old Ironsides, Union and Liberty.

Abraham Lincoln: Address at Gettysburg.

Samuel F. Smith: America.

Julia Ward Howe: Battle-Hymn of the Republic.

Special preparation will be required in the lives and principal works of the following:

Daniel Webster
Washington Irving
James Fenimore Cooper
William Cullen Bryant
William H. Prescott
George Bancroft
Ralph Waldo Emerson
Nathaniel Hawthorne
Henry Wadsworth Longfellow
John Greenleaf Whittier
Oliver Wendell Holmes
Edgar Allan Poe
Harriet Beecher Stowe
Benson J. Lossing
John Lothrop Motley
James Russell Lowell
Francis Parkman
Louisa M. Alcott
Josiah Gilbert Holland

3 **Special studies in American literature.**— In addition to the general study of the prominent writers mentioned above, it is proposed to include in each examination a special study of some single work of which notice will be given in advance. The questions on such work will cover its plan, its object and its literary merits. Students should not only be familiar with its contents but should also commit a few choice selections to memory. The works enumerated below, or others to be announced hereafter, will be used for this purpose:

Longfellow: Building of the Ship, Evangeline, Hiawatha.

Bryant: Thanatopsis.

Irving: Sketch-Book, Alhambra.

Hawthorne: House of the Seven Gables.

Emerson: Essays on Compensation and Self-reliance.

Holmes: Autocrat of the Breakfast-Table.

Whittier: Snow-Bound.

Jackson: Ramona.

Course in English reading.— The subjects for this examination will be published each year. The questions on works announced for special study will include their plan, object and literary merits. In addition to an accurate knowledge of the contents of such works, students should commit a few choice selections to memory.

The following lists are intended for the academic years 1891, 1892 and 1893:

1 Subjects for the academic year beginning Aug. 1, 1890.—
Shakspere: Julius Cæsar and Merchant of Venice.
Coleridge: Ancient Mariner.
Longfellow: Evangeline.
Macaulay: Essay on Lord Clive.
Webster: First Bunker Hill Oration.
Irving: Alhambra.
Scott: Old Mortality.
George Eliot: Silas Marner.
Hawthorne: House of the Seven Gables.

2 Subjects for the academic year beginning Aug. 1, 1891.—
Shakspere: Julius Cæsar and As You Like It.
Scott: Marmion and Talisman.
Longfellow: Courtship of Miles Standish.
Addison: Sir Roger de Coverley Papers.
Macaulay: Second Essay on the Earl of Chatham.
Webster: First Bunker Hill Oration.
Irving: Alhambra.
George Eliot: Scenes from Clerical Life.
Hawthorne: House of the Seven Gables.

3 Subjects for the academic year beginning Aug. 1, 1892.—
Shakspere: Julius Cæsar and Twelfth Night.
Scott: Marmion and Ivanhoe.
Longfellow: Courtship of Miles Standish.
Addison: Sir Roger de Coverley Papers.
Macaulay: Second Essay on the Earl of Chatham.
Emerson: American Scholar.
Irving: Sketch-Book.
Dickens: David Copperfield.

GROUP I CONTINUED

GERMAN AND FRENCH

First year German	**First year French**
Second year German	**Second year French**
Third year German	**Third year French**

As the examinations in French and German are wholly in writing, it is necessary to limit the test to translation, grammatical and literary questions, and the reproduction of selections, previously announced, from memory. The study of French and German, under a competent instructor, furnishes linguistic discipline of the highest order. The French and German literatures are so valuable that the ability to read these languages, even without the power of speaking them, must be regarded as an important acquisition. It is urged, however, as of great weight, to form, at the outset of the study, a good pronunciation, even though this may not enter into the examination. This, although difficult, may be at least approximately attained by means of careful attention and continued practice, and no effort of either teacher or student should be spared to effect this end.

Teachers are also specially urged to require the student from the first to translate with grammatical accuracy, but into the English idiom and always into good English. A failure in this regard robs the study of one of its most valuable features.

Grammatical rules should be taught by the aid of practical examples. From the very beginning students should learn to understand simple sentences, spoken by the teacher, and later, questions. The simplest rules afford an opportunity for comparison of French or German with English. Teachers are advised to use, in French or German conversation, the vocabularies contained in the exercises and selections studied, the objects being to insure a good pronunciation and to fix words and grammatical rules in mind.

The selections from French and German literature, referred to in this syllabus, indicate the character of the work required of candidates in the several courses. The examinations may include selections from other works of about the same degree of difficulty.

First year German.*— It is expected that the candidate will be able to translate at sight, and into good English, easy selections from German authors, containing words in most common use; to translate short English sentences into German; to show a reasonable degree of proficiency in elementary grammar, particularly in the topics included in the next paragraph; to write from memory one or more of the following selections or others to be announced hereafter:

Uhland: Der gute Kamerad, Der Wirtin Töchterlein, Das Schloss am Meere.

Heine: Die Lorelei, Du bist wie eine Blume.

1 **Elementary grammar.** — Gender; declension of the articles, of such nouns as are readily classified and of pronouns; declension and comparison of adjectives; the conjugation of weak verbs, of the three auxiliaries, of the modal auxiliaries, of strong verbs in common use, of impersonal and reflexive verbs, of separable and inseparable compound verbs; use of adjectives in uninflected form as adverbs, formation of adverbs by adverbial endings, original adverbs, cases and compounds used adverbially; prepositions in common use, governing the genitive, dative, accusative, dative or accusative; the commonest conjunctions; general rules of syntax such as those for the order of the sentence, for the uses of the genitive, dative and accusative cases, and for the indicative, imperative, infinitive and subjunctive modes.

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*The German spelling adopted in the question papers is that taught generally in Prussian schools since the school-year 1880–'81.

2 Suggestions.— In preparing for this examination the following suggestions may be found useful:

a About one-half of the credits will be given to translation.

b While formal grammar should form an important part of the study, it is recommended that the student begin reading at the earliest possible moment. To this end a reader that is progressive, representative and helpfully annotated, will be found of very great value.

c In learning nouns of the most common occurrence it will be of great use to fix in mind at the same time an article to determine the gender.

d Reading at sight is recommended as an important part of the class exercise.

e Conversation in German; letter-writing; recitation; writing from dictation and exercises in reproduction; reading aloud from modern or contemporary works will all be found useful exercises.

Second year German.— The following will be expected of the candidate:

1 Grammar.— Proficiency in more advanced grammar: A thorough knowledge of accidence and of the essentials of syntax — especially the use of the subjunctive and infinitive modes, and word order in connected discourse.

2 Translation into English. — Ability to read at sight more difficult selections from such simple works as

Jacob und Wilhelm Grimm: Kinder-und Hausmärchen.
Andersen: Bilderbuch ohne Bilder.
Hauff: Das kalte Herz.
Storm: Immensee.
von Hillern: Höher als die Kirche.
Meissner: Aus meiner Welt.
Leander: Träumereien.
Bernhardt: Novelletten Bibliothek.

Words not in common use will be given in vocabularies.

3 Translation into German.— Ability to translate longer English sentences into German.

4 **Repetition from memory.**— Ability to write from memory one or more of the following selections or others to be announced hereafter :

Feuchtersleben : Scheiden.
Schneckenburger : Die Wacht am Rhein.
Rückert : Barbarossa.
Goethe : Das Veilchen, Wandrers Nachtlied.

Third year German. — The following will be expected of the candidate :

1 **Grammar.**— A thorough knowledge of the grammar.

2 **Translation into English.** — Ability to read at sight selections from such standard works as

Lessing : Nathan der Weise, Minna von Barnhelm.
Goethe : Hermann und Dorothea.
Schiller : Die Jungfrau von Orleans, Wilhelm Tell.

Examination papers will contain vocabularies of unusual words.

3 **Translation into German.**— Ability to translate into German connected passages in English.

4 **Repetition from memory.**— Ability to write from memory one or more of the following selections or others to be announced hereafter :

Goethe : Der Sänger, Gesang der Geister über den Wassern.
Schiller : Die Hoffnung.
Heine : Belsazar.
Körner : Gebet während der Schlacht.

5 **German authors.**— Some knowledge of the lives and works of a few of the most celebrated German authors.

First year French.— It is expected that the candidate will be able to translate at sight, and into good English, easy selections from French authors containing words in most common use ; to translate short English sentences into French ; to show a reasonable degree of proficiency in elementary grammar, particularly in the topics included in the next paragraph ; to write from memory one or more of the following selections or others to be announced hereafter :

Perrin: Le Chêne et le Sycomore.
E. de Loulay: L'Amitié.
Boucher de Perthes: La petite Mendiante.
Leconte de Lisle: Trois Fils d'Or.
Victor Hugo: La Tombe dit à la Rose.

1 **Elementary grammar.**— The articles; gender; inflection of nouns, pronouns and adjectives; partitive and inclusive senses of the noun; comparison of adjectives; formation and comparison of adverbs; the commonest compound adverbs with those of place, time and degree; prepositions and conjunctions in common use; conjugation of *avoir* and *être*, of regular verbs, of irregular verbs in common use, of reflexive and impersonal verbs; common idioms; general rules of syntax.

2 **Suggestions.**— In preparing for this examination the following suggestions may be found useful:

a About one-half of the credits will be given to translation.

b While formal grammar should form an important part of the study, it is recommended that the student begin reading at the earliest possible moment. To this end a reader that is progressive, representative and helpfully annotated, will be found of very great value.

c In learning nouns of the most common occurrence it will be of great use to fix in mind at the same time an article to determine the gender.

d Reading at sight is recommended as an important part of the class exercise.

e Conversation in French; letter-writing; recitation; writing from dictation and exercises in reproduction; reading aloud from modern or contemporary works will all be found useful exercises.

Second year French.— The following will be expected of the candidate:

1 **Grammar.**— Proficiency in more advanced grammar: A thorough knowledge of accidence and of the essentials of syntax, especially the use of the modes and tenses, and the more frequently occurring idiomatic phrases.

2 **Translation into English.** — Ability to read at sight more difficult selections from such works as

Sand: La Mare au Diable.

Maistre: Voyage autour de ma Chambre.

Lamartine: Graziella.

Feuillet: Le Roman d'un jeune Homme pauvre.

Halévy: L'Abbé Constantin.

Daudet: La Belle-Nivernaise, La dernière Classe, Le Siège de Berlin et d'autres Contes.

Words not in common use will be given in vocabularies.

3 **Translation into French.**— Ability to translate longer English sentences into French.

4 **Repetition from memory.**— Ability to write from memory one or more of the following selections or others to be announced hereafter:

La Fontaine: La Cigale et la Fourmi, Le Corbeau et le Renard.

Alfred de Musset: Adieu.

Châteaubriand: Le Montagnard Émigré.

Béranger: Adieux de Marie Stuart.

Third year French.— The following will be expected of the candidate:

1 **Grammar.**— A thorough knowledge of the grammar.

2 **Translation into English.**— Ability to read at sight selections from classic authors such as

Corneille: Le Cid.

Molière: Le Bourgeois Gentilhomme, L'Avare.

Racine: Athalie, Esther.

Examination papers will contain vocabularies of unusual words.

3 **Translation into French.**.— Ability to translate into French connected passages in English.

4 **Repetition from memory.**— Ability to write from memory one or more of the following selections or others to be announced hereafter:

La Fontaine: Le Chêne et le Roseau.

Béranger: Le Retour dans la Patrie.

Rouget de Lisle: La Marseillaise.
Victor Hugo: La pauvre Fleur.
Lamartine: Hymne de l'Enfant à son Réveil.

5 **French authors.**— Some knowledge of the lives and works of a few of the most celebrated French authors.

GROUP I CONCLUDED

LATIN AND GREEK

- First year Latin
- Cæsar's Commentaries
- Sallust's Catiline
- Cicero's Orations
- Ovid's Metamorphoses
- Virgil's Æneid
- Virgil's Eclogues
- Latin composition
- First year Greek
- Xenophon's Anabasis
- Homer's Iliad
- Greek composition

It is recommended that in the preliminary drill the attention of the student be called constantly to the roots of words and their significations, and that he become very familiar with the meanings of the inflectional endings, with a view to acquiring the ability to translate Latin and Greek at sight. The practice of translation both at sight and by ear should be begun very early and should be continued throughout the course. In the examinations in Cicero, Virgil and Homer, passages will be given for translation at sight.

The student will be expected to know, and as far as possible to indicate in his translation, the precise force of each Greek particle. He should be perfectly familiar with the quantity of penultimate syllables as affecting pronunciation in Latin and with the laws of accent in Greek.

The examinations in Cæsar, Sallust, Cicero, Ovid and Virgil will require a thorough knowledge of the Latin constructions used by these authors. A corresponding degree of familiarity with the Greek constructions of Xenophon and Homer will be expected.

The candidate should be familiar with the arrangement of words, the more common figures of speech and the Roman method of reckoning time. He will be presumed to know the place in literature of each author studied, and he should have some knowledge of the qualities of style, of the characteristics of the principal works, and of the chief events in the life of each of these authors.

Questions on classic geography and antiquities will be included with those on each author. It is, therefore, expected that, in the study of the authors, the candidate will become familiar with the geography of the countries treated. To this end practice is recommended in drawing outline maps of Italy and Greece, and of such countries as may be mentioned in the text [*e. g.*, a map of Gaul, in an examination on Cæsar; or of Asia Minor and Western Asia, for the Anabasis, or Cicero's De Lege Manilia], with the principal rivers, mountain ranges and cities. In an examination on Virgil's Æneid the student should be prepared to draw an outline map and to trace thereon the course of Æneas, naming and locating his principal stopping places. He should also be able to give the reasons assigned by the poet for the arrival at and departure from those ports. So in the study of the Anabasis the route of the 10,000 in their advance and retreat should be made a matter of careful inquiry. The brilliant exploits of Cæsar's Gallic campaign, with the principal battles, manœuvres and stratagems should be studied thoroughly. The student should also be acquainted with the modern names of ancient places. Ability to explain the principal historic and mythologic allusions in the text will be expected in all classic examinations. Attention should be given to references to manners and customs, to dress, food, education and religion, to laws and modes of government, to arms and armies, ships and navigation, etc. In general, the candidate must show a fair acquaintance with the ordinary customs of Greek and Roman life in classic times. This will require a careful study of the references in the text.

First year Latin.— The examination is supposed to be held after the student has had instruction for at least one year. The candidate is expected to have a thorough knowledge of forms in common use, and to show a reasonable degree of proficiency in the topics of elementary grammar included in the following paragraph:

1 **Elementary grammar.**— Accentuation, rules for gender, declension of regular nouns [Greek nouns excepted] and of *deus, domus, senex, vis;* declension of adjectives, participles and pronouns; comparison of regular adjectives and of *bonus, malus, magnus, multus, parvus;* formation and comparison of adverbs; conjugation of regular verbs [including deponents] and of *sum* and its compounds, of *volo, nolo, malo, fero, eo* and *fio;* formation and meaning of the periphrastic conjugations; general rules of syntax of nouns, pronouns and adjectives; of the indicative, imperative and infinitive modes; of the subjunctive mode in principal clauses and in the simpler forms of indirect discourse; of conditional sentences; of the simpler expressions of purpose and result; of temporal and causal clauses.

2 **Translation.**— The candidate is also expected to translate a selection from easy Latin into English and short English sentences into Latin. It is strongly recommended that translation of connected passages be taught from the first. The vocabulary which the student is required to know is that found in the first five chapters of the first book of Cæsar's Commentaries.

Cæsar's Commentaries.— Four books of Cæsar's Commentaries are required for this examination. The candidate will be expected to translate any passages selected into good English which shall at the same time indicate as closely as possible the construction of the original. He should be thoroughly familiar with regular and common irregular inflections. He should be able to state clearly and to apply the most important rules of syntax. Thorough training in the laws of *oratio obliqua* is strongly advised. Constant attention to English words derived from Latin words in the text is also recommended as adding to the interest and to the value of the study of Latin. The student should be able to give the meaning of each constituent of compound words and the effect of each on the signification of the compound. He should be taught to distinguish the primary word and the force of the termination in derivatives.

Sallust's Catiline.— The candidate should be thoroughly familiar with the historian's account of Catiline's conspiracy. He should be prepared to discuss the merits of Sallust as a writer and his fairness as a historian.

Reference is made to the general suggestions for the study of Cæsar's Commentaries.

Cicero's Orations.— The examination in Cicero will include the four orations against Catiline, the oration on the Manilian Law and that for Archias. It will presuppose careful attention on the student's part to the analysis of the orator's thought in any passage set for examination and to its bearing on the argument or its place in the general plan of the oration. The candidate should be able to state concisely the occasion and the object of each oration, and to give a short outline of the plan of each. In translation, a higher standard of excellence in the choice of words and more careful discrimination in the use of synonyms will be expected. The teacher is advised to cultivate attention on the part of the students to felicities of expression and to rhetorical excellences or blemishes in the great orator's speeches.

Ovid's Metamorphoses.— Selections will be made from the following subjects in the Metamorphoses: Book 1, Deucalion and Pyrrha; Book 2, Phaethon; Book 4, Pyramus and Thisbe; Book 6, Niobe; Book 8, Daedalus; Book 10, Orpheus and Eurydice; Book 11, Story of Midas. These selections include about 1,000 lines. The student should have a general knowledge of figures of speech, of the rules of prosody and of the laws of hexameter verse.

Reference is made to the general suggestions for the study of Cæsar's Commentaries.

Virgil's Æneid.— Six books of Virgil's Æneid are required for this examination. Greater smoothness in translation, without the sacrifice of accuracy, and greater familiarity with the rules and exceptions of syntax will be expected. The student should have a thorough acquaintance with figures of speech, the rules of prosody and their exceptions, and the laws of hexameter verse. The scansion of exceptional as well as regular verses from the text will be required. Irregular verbs and modified verb stems should be familiar to the student. The declension of Greek nouns will be required.

Virgil's Eclogues.— Reference is made to the general directions for the study of Virgil's Æneid.

Latin composition.— It is assumed that in teaching Latin practice in translating English into Latin will be required from the first. All the "Latin lessons" recently published, as books introductory to the study of Latin, contain such exercises. Students are advised from the first to write the English-into-Latin exercises and to cultivate the habit of giving such exercises orally in review.

1 Scope of examination.— The aim of the examination in this study will be to test the candidate's familiarity with the regular constructions and with the more common idioms of the Latin language, rather than with its rarer forms. He should know perfectly the regular inflections. He should be able to apply readily the most important principles of syntax, and should know their chief exceptions. He should be thoroughly familiar with the inflection of the irregular nouns, adjectives, pronouns, verbs and adverbs in common use; with the principles of indirect discourse and with the meaning and use of the various forms of conditional sentences. He should also be familiar with such Latin idioms as he may fairly be supposed to have met repeatedly in the Cæsar and Cicero required for admission to college.

The sentences for translation will be based almost entirely on the vocabulary and idiom of the first book of Cæsar's

Commentaries but within this limit a high degree of accuracy will be expected.

2 **Suggestions.**— While it is not proposed to suggest any method as essential or to fetter in any way the freedom of class-room work, the following suggestions are offered as having contributed much, in the experience of many teachers, to success in teaching Latin prose composition :

Each student commits to memory the vocabularies and the Latin examples, and learns carefully the principle of syntax to be illustrated. Each member of the class brings to the daily recitation all the sentences for the day, carefully written out. These sentences are written on the blackboard one by one ; are criticised by the other members of the class, and are finally corrected by the teacher. [Colored crayon emphasizes the correction.] The sentences as corrected are copied into blank-books for preservation, and are committed to memory and recited at the beginning of the next day's recitation, the teacher giving the English and the student the corresponding Latin. Little variations by the teacher in person, tense, number, etc., will prevent this work from becoming mere parrot-like repetition. Some teachers have tried with good results the plan of having the class, at the close of each recitation in Cæsar or Cicero, write out in the best Latin at their command one of the sentences in the recitation for the day, the teacher giving a literal English translation.

First year Greek.— The examination is supposed to be held after the student has had instruction for at least one year. The candidate is expected to have a thorough knowledge of forms in common use, and to show a reasonable degree of proficiency in the topics of elementary grammar included in the following paragraph :

1 **Elementary grammar.**— Laws of quantity and accent ; rules for euphony ; regular declension of nouns ; declension of adjectives, participles and pronouns ; regular comparison of adjectives ; formation and comparison of adverbs ; formation of tense stems ; conjugation ; general rules of syntax of

nouns, pronouns and adjectives; of the indicative, imperative, subjunctive and optative modes in principal clauses; conditional sentences; the usual relative, temporal and causal clauses with those denoting purpose; the use of the subjunctive and optative modes in the simpler forms of indirect discourse.

2 **List of common irregular verbs.**— An accurate knowledge of the forms of the Greek verb is so important that it is thought desirable to require the student to know the parts of the more common irregular verbs.

A list* of such verbs is given below, arranged according to the relation of the present to the other forms, and the following considerations have guided in the construction of the table containing them:

a The learning of forms should be regulated, as far as possible, by the necessities of use.

b It is desirable that the student of Greek should know the commonest forms well rather than have an uncertain intimation of a great mass of possible but rare forms.

c A sound acquaintance with Greek grammar must be based on a sure knowledge of its most important literary idiom, viz., the dialect of the Attic prose writers.

d It is believed that the thirty verbs here given represent the commonest words and the commonest types of verbal irregularities.

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* NOTE.—This list was kindly furnished by Prof. B. I. Wheeler, of Cornell University, who also adds the following:

"The lists of verbs given in our grammars, and even in our introductory books, often confuse the common and essential with the rare and unimportant, and place non-Attic, late and rare forms on an equal footing with the standard forms used by Attic prose writers of the best period. Thus, the inscriptions show that *ἧλων* is not a good Attic form. Of the two aorists of *φέρω* usually given in our lists, *ἤνεγκον* is rare and poetic, while *ἤνεγκα* is in common prose use. The inscriptions, now followed by good texts, show that *τέθηκα* and not *τέθεικα* is the correct perf. act. of *τίθημι*. The Attic future of *ἔρχομαι* is *εἶμι* and not *ἐλεύσομαι*, which is Ionic or poetic and never occurs in classic Attic prose."

LIST OF COMMON IRREGULAR VERBS

Arranged according to the relation of the present to the other forms

Pres.	Fut.	Aor.	Perf.	Perf. Mid.	Aor. Pass.
ἀκούω	ἀκούσομαι	ἤκουσα	ἀκήκοα		
ἵημι	ἥσω	ἧκα	εἷκα	εἷμαι	εἵθην
τίθημι	θήσω	ἔθηκα	τέθηκα (preferable to τέθεικα)	[κεῖμαι]	ἐτέθην
ἄγω	ἄξω	ἤγαγον	-ἦχα	ἧγμαι	ἤχθην
λείπω	λείψω	ἔλιπον	λέλοιπα	λέλειμμαι	ἐλείφθην
πράττω	πράξω	ἔπραξα	πέπραχα	πέπραγμαι	ἐπράχθην
τρέπω	τρέψω	ἔτρεψα	τέτροφα	τέτραμμαι	ἐτράπην
τρέφω	θρέψω	ἔθρεψα	τέτροφα	τέθραμμαι	ἐτράφην
φεύγω	φεύξομαι	ἔφυγον	πέφευγα		
βαίνω	-βήσομαι	-έβην	βέβηκα	-βέβαμαι	-εβάθην
φαίνω	φανῶ	ἔφηνα	-πέφαγκα	πέφασμαι	ἐφάνϑην
βάλλω	βαλῶ	ἔβαλον	βέβληκα	βέβλημαι	ἐβλήθην
στέλλω	στελῶ	ἔστειλα	-έσταλκα	ἔσταλμαι	-εστάλην
γίγνομαι	γενήσομαι	ἐγενόμην	γέγονα	γεγένημαι	

LIST OF COMMON IRREGULAR VERBS — CONTINUED

Arranged according to the relation of the present to the other forms

Pres.	Fut.	Aor.	Perf.	Perf. Mid.	Aor. Pass.
ἁλίσκομαι	ἁλώσομαι	ἑάλων	ἑάλωκα		
γιγνώσκω	γνώσομαι	ἔγνων	ἔγνωκα	ἔγνωσμαι	ἐγνώσθην
εὑρίσκω	εὑρήσω	εὗρον	εὕρηκα	εὕρημαι	εὑρέθην
αἰσθάνομαι	αἰσθήσομαι	ᾐσθόμην	ᾔσθημαι		
ἐλαύνω	ἐλῶ	ἤλασα	ἐλήλακα	ελήλαμαι	ἠλάθην
λαμβάνω	λήψομαι	ἔλαβον	εἴληφα	εἴλημμαι	ελήφθην
πυνθάνομαι	πεύσομαι	ἐπυθόμην	πέπυσμαι		
τυγχάνω	τεύξομαι	ἔτυχον	τετύχηκα		
αιρέω	αἱρήσω	εἷλον	ᾕρηκα	ᾕρημαι	ᾑρέθην
ἐσθίω	ἔδομαι	ἔφαγον			
ἔρχομαι	εἶμι	ἦλθον	ἐλήλυθα		
ἔχω	ἕξω σχήσω	ἔσχον	ἔσχηκα		
λέγω	ἐρῶ	εἶπον	εἴρηκα	εἴρημαι	ἐρρήθην
ὁράω	ὄψομαι	εἶδον	ἑώρακα ἑόρακα	ἑώραμαι ὦμμαι	ὤφθην
πάσχω	πείσομαι	ἔπαθον	πέπονθα		
φέρω	οἴσω	ἤνεγκα	ἐνήνοχα	ενήνεγμαι	ἠνέχθην

- Forms preceded by a hyphen are used only in composition

3 **Translation.**—The candidate is also expected to translate a selection from easy Greek into English and short English sentences into Greek. As in Latin it is strongly recommended that translation of connected passages be taught from the first. The vocabulary which the student is required to know is that found in the first 12 sections of the second chapter of the first book of the Anabasis.

Xenophon's Anabasis—Three books of Xenophon's Anabasis are required for this examination.

The candidate will be expected to translate any passages selected into good English which shall at the same time indicate as closely as possible the construction of the original. He should be thoroughly familiar with regular and common irregular inflections. He should be able to state clearly and to apply the most important rules of syntax. Thorough training in the laws of *oratio obliqua* is strongly advised. Constant attention to English words derived from Greek words in the text is also recommended as adding to the interest and to the value of the study of Greek. The student should be able to give the meaning of each constituent of compound words and the effect of each on the signification of the compound. He should be taught to distinguish the primary word and the force of the termination in derivatives.

It is suggested that in the opinion of many careful teachers the Greek verb is best mastered by following the tense-systems, a tense at a time, through all modes and voices. Careful and frequent analysis of verb-forms into stem, augment, reduplication, tense-sign, connecting or mode-vowel and personal ending is advised. The rules for euphonic changes of mutes and liquids, and for the contraction of vowels should be thoroughly learned and frequently applied in inflection.

Homer's Iliad.—Three books of Homer's Iliad are required for this examination. Greater smoothness in translation without the sacrifice of accuracy, and greater familiarity with the rules and exceptions of syntax will be expected. The student should have a thorough acquaintance with figures of speech, the rules of prosody and their exceptions, and the laws of hexameter verse. The scansion of exceptional as well as regular verses from the text will be required. Irregular verbs and modified verb stems should be familiar to the student. A knowledge of epic forms and of their corresponding forms in Attic Greek will be expected.

Greek composition.— It is presupposed that in preparation for the study of the Anabasis the student has had thorough drill in the *elements* of the language, and that he can begin his special preparation for the examination in Greek composition with a good working knowledge of Greek forms and of the simpler principles of construction.

1 **Scope of examination.**— It is suggested that proper preparation in this subject can be made only by careful, systematic drill in the translation of English into Greek, and that the best results will be secured by making the lessons *consecutive*, say four or five times a week for a period of at least ten weeks.

The sentences for translation will be based almost entirely on the vocabulary and idiom of the first book of the Anabasis, but within this limit a high degree of accuracy will be expected.

All words should be properly accented, and conspicuous failure in this respect will be deemed sufficient ground for the rejection of the candidate.

GROUP 2

MATHEMATICS*

Arithmetic
Advanced arithmetic

Algebra
Advanced algebra

Plane geometry
Solid geometry
Plane trigonometry

It is not purposed to prescribe in this syllabus any set plan for the teaching of mathematics, but merely to offer some suggestions in accordance with the opinions of eminent mathematicians.

If the branches of mathematics, included in these examinations, are to afford the best training for the intellect, they must not be too abstractly taught. Teachers should bear in mind the fact that practical mathematicians use generally the ordinary operations of arithmetic, simple algebra and the rudiments of geometry, with industrial drawing. They have little occasion, comparatively speaking, to solve difficult problems in the higher mathematics.

It is highly desirable to teach the rudiments of geometry and elementary algebra before the technicalities of commercial arithmetic. By following this plan, the thoughtful teacher avoids in a large measure the mechanical repetition of rules and processes, which is the inevitable consequence of an endeavor to teach subjects beyond the comprehension of pupils, and gains time for practical work.

Arithmetic.— The preparation necessary to insure success in the examination is a thorough knowledge of practical arithmetic and the ability to perform with accuracy, neatness and dispatch, test-exercises outside of the text-book, involving definitions, principles, processes and analyses. In teaching this subject, mechanical exercises, puzzles and operations with enormous numbers should be avoided, and attention paid to mental work and to practical applications.

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* In the revision of the requirements in mathematics, valuable assistance was rendered by Principal C. T. R. Smith of Lansingburg, N. Y.

For the use of denominate numbers in general, and to insure skill in measurements, candidates should be familiar with such standards as the foot and the two-foot rule, yard-stick, carpenter's square, quart, gallon, peck and half-bushel, with similar measures of the metric system; with weighing-instruments of various kinds; with time-measures, etc., etc.; with simple business forms, such especially as ordinary bills of merchandise, promissory notes and receipts.

As a further guide to indicate the quality of the preparation needed, the following list of topics and exercises, included within the scope of the examination, has been prepared:

1 **Notation and numeration.**— The Arabic and the Roman methods in detail, including orders of units, periods, punctuation by comma and decimal point, etc., as far as applicable to either or to both of these systems; the superiority of the Arabic notation for ordinary uses and the special uses to which the Roman is still applied.

Numeration of integers and decimals: The French method, division into periods, names of periods and method of reading.

2 **Fundamental operations.**— Fundamental processes or operations in arithmetic, named and defined, and the general rule and method of "proof" for each operation.

3 **Multiples, measures and factors.**— Factors, prime and composite numbers, and cancellation; process of factoring; aids in finding factors; principle and process of cancellation.

Greatest common divisor and least common multiple; method of finding and use of each.

4 **Fractions.**— Fractions, common and decimal: Essential difference and methods of changing from one form to the other; terms or parts of a common fraction, and their mutual relations; the various reductions and the addition, etc., of fractions, both common and decimal.

5 **Denominate numbers and practical measurements.**— Classification of denominate numbers; tables of denominate numbers according to both the common and the metric systems; reduction, addition, etc., of denominate numbers, including the use of the metric sytem; practical applications in measurements, carpeting, painting, roofing, plastering, paper hanging, paving, masonry and brick work, lumber, capacity of bins and cisterns, etc.; mensuration of triangles, rectangles, squares, trapezoids, circles, cylinders, cubes and other rectangular solids, with applications to familiar objects and to common business transactions.

6 **Ratio and proportion.**— Ratio and proportion, simple and compound, including the "rule of three."

7 **Percentage.**— Percentage, and its various business applications, including commission, insurance, taxes, stocks, interest, simple and compound, and partial payments; also discount, ordinary and as practiced at banks.

8 **Involution and evolution.**— Square root, with practical applications in mensuration.

Advanced arithmetic.— It is expected that the candidate for this examination will know thoroughly not only the various arithmetic processes but also the reasons for each step, and will be able to give accurate and complete explanations; to formulate clear and precise definitions of all the technical terms used in connection with the subjects treated; to give brief and accurate methods of operation; in short, to exhibit a higher degree of facility in arithmetic processes than is required in the preliminary examination. Advanced arithmetic should be studied as a review and completion of the subject after the student has pursued geometry and algebra; accordingly, in this examination algebraic or geometric explanations of principles or processes will be accepted if presented.

In addition to a review of the subjects required for the preliminary examination, with special reference to the demonstration of principles and the explanations of processes, the candidate should make preparation on the following topics:

1 **Definitions.**— Of such terms as have been given in the syllabus of arithmetic; of other terms used in connection with subjects mentioned below.

2 **Notation and numeration.**— Scales of notation [binary, quinary, etc.]; exercises in each scale; uniform scales as the decimal; varying scales as those used in the various tables of compound numbers; the English method of numeration; the names and approximate equivalents of the principal units of the metric system; their prefixes and the meaning of each; the different methods of reading the same number written in the metric notation; signs of relation, of operation, of grouping, of aggregation.

3 **Multiples, measures and factors.**— Multiples of 2, 3, 4, 5, 6, 8, 9, 10, 11; casting out 9's and 11's; detecting primes and factoring composites; principles regarding divisors and multiples; processes of finding the greatest common divisor and least common multiple; finding the greatest common divisor and least common multiple of fractions; a clear explanation of the process of finding the g. c. d. by division; the principles and applications of cancellation.

4 **Fundamental operations.**— Short methods in multiplication and division of integers and decimals; demonstration of principles, and analysis of processes of reduction, addition, etc., of common fractions, with illustrations by lines or surfaces.

5 **Reduction.**— Reduction of complex fractions and circulating decimals to simple fractions; the various cases of the reduction of denominate numbers,— integral, decimal, fractional and metric.

6 **Standards and practical measurements.**— Relation of each unit of length, surface or area, and volume or capacity to the yard or metre; history of the standard yard of England and the United States; also of the standard metre; extent to which the metric system is adopted and used by the different nations; its advantages and disadvantages;

the history of the Julian and Gregorian calendars; standards of weight, time, angular measure, money [United States and English], with multiples and subdivisions; comparison of the avoirdupois pound and ounce with the Troy pound and ounce; comparison of the weights, measures and money of the different nations, especially those of the United States, England, France and Germany; mensuration of regular polygons, prisms, cylinders, spheres; of pyramids, cones, and their frusta; of the circle; computation of the contents and dimensions of bins, tanks, cisterns, etc.; longitude and time.

7 **Ratio and proportion.**— A more extended study of ratio and proportion, and its fundamental principles, methods, tests and applications; partitive proportion; partnership, simple and compound; similar surfaces; similar volumes; ratio of intensities of light, heat, sound, gravitation, magnetism, at different distances; reduction and comparison of ratios; relation of ratio to per cent; also to division and fractions.

8 **Percentage.**— More extended treatment of percentage, its principles, problems and applications; profit and loss, commission and brokerage. insurance, taxes, duties, stock and stock investments; trade discount, true discount and present worth, bank discount, assessments and dividends.

9 **Interest.**— The common methods of computing interest; the method of computing the exact interest by regarding days as 365ths of a year; short methods; the various problems in interest; annual interest; partial payments, the United States rule and the merchants' rule; averaging of accounts and accounts current; savings-bank accounts; equation of payments; commercial paper, and the usual forms and customs pertaining to transactions with banks; exchange, domestic and foreign; compound interest and its problems.

10 **Involution and evolution.**— Powers,— perfect, imperfect [surds]; principles and methods pertaining to involution and evolution as applied to square and cube roots; method

of finding roots of any degree; applications to the right triangle, to similar surfaces and volumes.

11 **Series.**— Arithmetic and geometric progressions, the five elements pertaining to each; fundamental problems; annuities at simple interest, at compound interest.

Algebra.— This examination covers what are usually designated as the elements of algebra, including quadratic equations. Instruction in this subject should be based on arithmetic and should include exercises in mental arithmetic and mental algebra. There are great advantages in beginning elementary algebra after a preliminary drill in elementary arithmetic and before an endeavor has been made to master the intricacies of commercial arithmetic. It is not proposed to make obligatory any particular plan for the study of algebra, but teachers are requested to bear in mind, in preparing candidates for the examination, the practical value of the ordinary operations of simple algebra.

The candidate should be trained to perceive and to indicate the logical sequence of a series of equations and to refer transformations to their underlying axioms and theorems. He must possess a theoretic knowledge of the principles involved in the algebraic operations, and must be able to give in writing definitions of the terms used and explanations of the methods employed. He must have so much practice in algebraic operations, and in the solution of problems, that he can perform at sight the ordinary examples coming within the assigned limits.

Attention is called to the following topics:

1 **Definitions and symbols.**— Symbols used for expressing algebraic quantities; symbols expressing operations; the definition of the terms used in algebra; the translation of common into algebraic language and the translation of algebraic expressions into common language.

2 **Addition.**— Quantities with like signs; quantities with unlike signs; addition of monomials; addition of polynomials.

3 **Subtraction.**— Relation of subtraction to addition; the

sign of the remainder; subtraction of monomials; subtraction of polynomials, the parenthesis and its uses.

4 **Multiplication.**— The algebraic signs in multiplication; the sign of the product; the multiplication of monomial quantities; the exponent of the product; the multiplication of polynomials by monomials; the multiplication of polynomials by polynomials; theorems as to forms of the product of two binomials having a common term, and as to the square of a polynomial.

5 **Division.**— The algebraic sign of the quotient; the division of monomials by monomials; the exponent of the quotient; the division of polynomials by monomials; the division of polynomials by polynomials; special cases of the division of binomials; reciprocals, zero powers and negative exponents.

6 **Factoring.**— Of expressions containing monomial and polynomial factors; of binomials in the form of $a^n \pm b^n$; of trinomials in the form of $a^2 \pm 2ab + b^2$; of trinomials containing two unequal binomial factors; of expressions in which the terms can be so arranged as to show a common compound factor.

7 **Highest common factor.**—Of monomials, of polynomials.

8 **Lowest common multiple.**—Of monomials, of polynomials.

9 **Fractions.**— The elements of a fraction; to reduce a fraction to lower terms; to reduce a fraction to a whole or to a mixed quantity; to reduce a mixed quantity to the form of a fraction; to reduce fractions to a common denominator; to reduce fractions to the least common denominator; to add fractions; to subtract one fraction from another; to multiply fractions together; to divide one fraction by another.

10 **Simple equations.**— Terms used in regard to equations; axioms as to equations; transposition of terms; suppression of equal terms; simple equations solved by addition and subtraction; by multiplication and division; to clear an equation of fractions; to obtain the value of the unknown quantity in terms of known quantities; solution of problems involving simple equations.

11 **Simple equations with two or more unknown quantities.**— The number of equations necessary; elimination by substitution; elimination by comparison; elimination by addition and subtraction; solution of problems involving simple equations with two or more unknown quantities.

12 **Involution.**— Raising a monomial to any power; raising a fraction to any power; raising a polynomial to any power; the binomial theorem as applied to cases in which the index of the power is a positive integer; law of the exponents; law of the coefficients.

13 **Evolution.**— Roots and their symbols; finding the root of a monomial; the signs of roots; the exponents of roots; finding roots of fractions; radical quantities; reducing radicals to their simplest form; adding and subtracting radicals; multiplying and dividing radicals; involution and evolution of radicals; solution of equations containing radicals; the square root of polynomials; the square root of arithmetic numbers; the cube root of polynomials; the cube root of arithmetic numbers.

14 **Quadratic equations.**— The solution of pure [incomplete] quadratic equations; the roots of a pure quadratic equation; affected [complete] quadratic equations; completing the square; roots of affected quadratic equations; solutions of problems involving quadratic equations; equations of higher degree which may be solved as quadratic equations; quadratic equations involving two unknown quantities; the method by substitution; the method by substituting $x = vy$; the method by substituting $x = u + v$, and $y = u - v$.

Advanced algebra.— The following is a summary of important points to which the attention of the candidate should be directed:

1 **Definitions.**— Of the terms used in advanced algebra.

2 **Radical quantities.**— Reducing radicals to their simplest form; adding and subtracting radicals; multiplying and dividing radicals; involution and evolution of radicals; general theory of exponents; multiplying and dividing im-

aginary quantities; the square root of binomial surds; rationalization of surds; solution of equations containing radicals.

3 **Quadratic equations.**— General laws; higher equations which can be solved by completing the square; problems involving quadratics; theory of quadratic equations.

4 **Inequalities.**— Fundamental proposition; an inequality reversed by changing the signs.

5 **Ratio and proportion [and variation].**— Mean proportionals; continued proportion; proportions taken by inversion, by alternation, by composition, by division; problems in proportion.

6 **Permutations and combinations.**— The number of permutations of n quantities taken r at a time; the number of combinations of n quantities taken r at a time.

7 **Arithmetic progression.**— Deduction of formulæ; any three of the quantities, a, l, n, d, S, being given to find the other two; problems in arithmetic progression.

8 **Geometric progression.**— Deduction of formulæ; any three of the quantities, a, l, n, r, S, being given to find the other two or a formula which shall express their value; problems in geometric progression.

9 **Binomial theorem.**— The expansion of any binomial into a series, the exponent being positive or negative, integral or fractional; the finding of any root of a number approximately by the binomial theorem.

10 **Continued fractions.**— The form of a continued fraction; conversion of proper fractions into terminated continued fractions; convergents; periodic continued fractions; applications.

11 **Undetermined coefficients.**—Identical equations; expansion of fractions into series; expansion of radicals into series; decomposition of rational fractions; reversion of series.

12 **Summation of infinite series.**— Recurring series of the first order, second order, third order; differential method; interpolation.

13 **Logarithms.**— What is meant by a system of loga-

rithms; properties of logarithms; use of logarithms; logarithm of the product of two numbers, of the quotient of two numbers, of any power of a number, of any root of a number; method of computing logarithms and the formation of tables; distinction between common and Napierian logarithms; method of using the tables; application of logarithms to the solution of exponential equations and to practical computations.

14 **General theory of equations.**— Divisibility of equations; commensurable roots; number of roots; formation of equations; composition of coefficients; fractional roots; imaginary roots; transformation of equations,— of an equation having fractional coefficients into another in which the coefficients are integral, that of the first term being unity; of a complete equation into one in which the second term is wanting; of an equation into another in which the root shall be some multiple of those of the first or shall differ from those of the first by a given quantity; derived polynomials; equal roots.

15 **Solution of numeric equations of higher degrees.**— Sturm's theorem; Horner's method.

Plane geometry.— The examination in this subject will, as the title implies, be confined to the geometry of the plane. It is meant in the question papers on this subject to test the ability of the candidate to give logical demonstrations of geometric propositions, with accurate and complete definitions of the terms employed. The study of geometry is justly regarded as one of the most valuable means of mental discipline. Nothing has ever been proposed which can be regarded as a substitute.

It is not proposed to make obligatory any particular plan for the study of geometry. If it is begun at a comparatively mature age, for example fourteen or fifteen, it will generally be sufficient to enter at once on the geometric demonstrations. But there are great advantages in initiating the child at a much earlier age into this study; in that case, however, the teacher must deal almost wholly with the facts of geometry, giving the instruction in the form of object-lessons, and making the child familiar with the terms and figures of geometry long before he can follow out a logical demonstration. A student thus initiated will pursue the higher study of this subject with an interest and a facility which one less favored would struggle long to obtain.

Exercises in solving approximately, by construction and measurement to scale, problems in "heights and distances" which would be solved in more advanced work by trigonometric calculations are strongly recommended. Students should be accustomed from the first to eye-measurement of lines, surfaces and angles.

It is essential in the preparation of this subject that the student be given as much original work as possible and that he be required to demonstrate theorems and to solve problems independent of the book.

The student should be taught the use of the rule and compasses, by means of which all the problems included in the following summary may be constructed. At the examination in geometry each candidate is expected to be provided with these instruments.

Without desiring to indicate a fixed and necessary order in which the subject is to be studied, the following particulars are enumerated for which the candidates will be held responsible :

1 **Preliminary notions.**— Conceptions as to the straight line ; the broken line ; the curved line ; as to the surface, plane and curved ; the plane figure ; the solid ; angles and their classification ; parallel lines.

Signification of the terms used in geometry, such as proposition, theorem, problem, demonstration, corollary, scholium, axiom, hypothesis, postulate.

The axioms and postulates of plane geometry.

2 **Intersecting lines and parallels.**— Propositions involving the relations of lines which intersect each other and of the angles which they make with each other.

Propositions relating to parallel lines intersected by other lines.

3 **Triangles.**— Classification of triangles and designation of their parts.

Propositions concerning the sides and angles of triangles; concerning the conditions which determine the equality of triangles.

4 **Polygons.**— Classification of polygons; sides and perimeter of polygons; convex and concave polygons; homologous angles and sides; classification of quadrilaterals.

Propositions relating to the exterior and interior angles of a polygon; to the properties of the several classes of quadrilaterals.

5 **Circles.**— Signification of terms used in the geometry of the circle.

Propositions relating to the circle and involving the relations of arcs, chords, and the circumference of the circle.

Propositions relating to tangents and secants, and to their intersections with the circumference.

Propositions relating to the intersection and contact of the circumferences of two circles, and to the distance between the two centres.

6 **Measure of angles.**— Measures, ratios,— commensurable and incommensurable — proportions.

Propositions concerning the relation and measurement of arcs and angles.

7 **Proportions and proportional lines.**— The theory of proportions and their transformations; propositions relating to the proportional division of the sides of a triangle.

Similar polygons and their homologous parts; propositions involving the conditions of similarity of triangles and other polygons, and the ratios existing between similar polygons.

Propositions in regard to the relation existing between two triangles having an angle in each equal; propositions involving the relations between the sides of a right-angled triangle, between the perpendicular let fall from the right angle and the segments of the hypotenuse; propositions regarding the relations of one side of a triangle to the other two sides; propositions as to the segments of two intersecting chords, as to two intersecting secants, as to an intersecting tangent and secant; proposition as to a triangle in which a line is drawn from any angle to the middle of the opposite side.

8 **Areas.**— Comparison and measurement of areas; area of a rectangle, of a parallelogram, of a triangle, of a trapezoid, and of any polygon; ratio between the areas of similar triangles, and of similar polygons in general; the area of a square on the hypotenuse of a right-angled triangle equivalent to the areas of the squares on the other two sides.

9 **Regular polygons and the measurement of the circle.**— Propositions relating to regular polygons inscribed in and circumscribed about a circle; area of a regular polygon; the area of a circle; ratio between the diameter of a circle and its circumference.

10 **Problems of construction.**— Problems involving the construction of parallels, the erection of perpendiculars, and the bisection of lines, arcs, and angles.

Problems relating to the construction of angles, triangles, and parallelograms.

Problems relating to the circle; to the construction of tangents to circles; to inscribing a circle in a triangle; to constructing on a given line a segment that shall contain an angle equal to a given angle.

Problems of construction, involving proportionality of lines; of a triangle equivalent to any given polygon; of a polygon similar to any given polygon; of a square equivalent to any given polygon, to the sum of any number of polygons, to the difference between any two polygons.

11 **Numeric problems.**— Numeric problems illustrating the application of the principles of plane geometry.

Solid geometry.— The attention of candidates should be called to the following summary:

1 **Definitions.**— Of the terms used in solid geometry.

2 **Planes and polyhedral angles.**— Conditions that determine the position of a plane.

Propositions relating to intersecting planes.

Propositions relating to lines perpendicular to other lines and to planes; to planes perpendicular to lines and to other planes.

Propositions relating to parallel planes, and to their intersection with lines both parallel and non-parallel.

Propositions relating to lines both perpendicular and oblique drawn from a point to a plane.

Proposition proving that two angles in different planes, having their sides parallel and lying in the same direction, are equal and their planes parallel.

Proposition proving that the sum of either two of the plane angles formed by the edges of a trihedral angle is greater than the third.

Proposition proving that the sum of the plane angles formed by the edges of any polyhedral angle is less than four right angles.

Proposition proving that if the plane angles formed by the edges of two trihedral angles are equal, the planes of the equal angles are equally inclined to each other.

3 **Preliminary notions.**— Conceptions as to prisms, pyramids and truncated pyramids; the different varieties of each and the different terms applied to each.

Conceptions as to the five regular polyhedrons.

Conceptions as to *The Three Round Bodies;* the manner in which each is generated and the terms applied to parts of each.

4 **Prisms.**— Propositions relating to the convex surface and volume; to sections made by planes parallel to the base; to equivalent prisms; to the relation existing between the opposite faces of a parallelopiped; to the relations existing between any two parallelopipeds having a common base or a common altitude.

Proposition proving that any parallelopiped may be divided into two equal triangular prisms.

Proposition proving that any parallelopiped is equivalent to a right parallelopiped having the same altitude and an equivalent base.

Propositions leading to and proving that the volume of any rectangular parallelopiped is equal to the product of its three dimensions; that the volumes of any two similar prisms, and hence of any two similar solids, are to each other as the cubes of any two homologous edges.

5 **Pyramids.**— Propositions relating to the convex surface and volume of a pyramid; to sections made by planes parallel to the base.

Proposition proving that two triangular pyramids having equal bases and equal altitudes are equal in volume.

Proposition proving that any triangular prism may be divided into three equivalent triangular pyramids.

6 **Frusta of pyramids.**— Propositions relating to the convex surface and volume of frusta of pyramids; to sections made by planes parallel to the base.

7 **Cylinders.**— Propositions relating to the convex surface and volume of cylinders; to sections made by planes parallel or perpendicular to the base.

8 **Cones.**— Propositions relating to the convex surface and volume of cones; to sections made by planes parallel to the base; to a section made by a plane passing through the vertex.

9 **Frusta of cones.**— Propositions relating to convex surface and volume; to sections made by planes parallel to the base.

10 **Spheres.**— Propositions leading to and proving that the surface of a sphere is equal to its diameter multiplied by the circumference of a great circle; to four great circles.

Proposition proving that any section of a sphere made by a plane is a circle.

Proposition as to planes perpendicular to the radius of a sphere.

Propositions as to the different relations spheres may bear to each other.

Proposition proving that the surface of a sphere is two-thirds that of the circumscribed cylinder.

Proposition proving that the volume of a sphere is equal to the product of its surface and one-third its radius.

11 **Numeric problems.**— Numeric problems illustrating the practical application of the principles of solid geometry.

Plane trigonometry.— The examination in trigonometry is confined to plane trigonometry. This is deemed to be all that the time available in an academic course will warrant. As the subject should occupy at least ten weeks, it is expected that it will be studied analytically as well as geometrically.

The candidate must be familiar with the use of logarithms, but the examination will not be carried into the methods of computing the logarithmic tables. It will include, however, the explanation of the nature and use of logarithms, and the methods of performing computations by means of them, and the explanation of the arrangement and use of the tables of trigonometric functions, both natural and logarithmic.

The principal points on which the candidate will be examined will be comprised under the following heads :

1 **Definitions.**— Of terms used in plane trigonometry.

2 **Measures of angles and arcs.**— The units by which angles are measured ; the units of arcs ; the length of a degree and of an arc of any number of degrees, minutes and seconds ; the complement of an arc or angle ; the supplement of an arc or angle.

3 **Trigonometric functions.**—The sine of an arc or angle ; the tangent ; the secant ; the cosine ; the cotangent ; the cosecant ; the variation of the trigonometric functions for different arcs ; the values of the several functions for arcs of 30°, 60°, 45° ; rules for determining the algebraic signs of circular functions ; trigonometric functions of negative arcs.

4 **Relations between the trigonometric functions of the same arc or angle.**— It is required to demonstrate that

$\sin a \csc a = 1;$ $\sin^2 a + \cos^2 a = 1;$

$\tan a \cot a = 1;$ $\tan^2 a + 1 = \sec^2 a;$

$\sec a \cos a = 1;$ $1 + \cot^2 a = \csc^2 a;$

$\tan a \cos a = \sin a.$

5 Relations between the trigonometric functions of different arcs or angles.— It is required to demonstrate the following equations, showing the relations of the sum and difference of two arcs or angles :

$$\sin\,(a+b)=\sin a \cos b+\cos a \sin b.$$
$$\cos\,(a+b)=\cos a \cos b-\sin a \sin b.$$
$$\sin\,(a-b)=\sin a \cos b-\cos a \sin b.$$
$$\cos\,(a-b)=\cos a \cos b+\sin a \sin b.$$

Also the following :

$$\tan\,(a+b)=\frac{\tan a+\tan b}{1-\tan a \tan b}. \qquad \cot\,(a+b)=\frac{\cot a \cot b-1}{\cot a+\cot b}.$$
$$\tan\,(a-b)=\frac{\tan a-\tan b}{1+\tan a \tan b}. \qquad \cot\,(a-b)=\frac{\cot a \cot b+1}{\cot b-\cot a}.$$

Also the following, showing the relations of double arcs or angles :

$$\sin 2a=2\sin a \cos a. \qquad \cos 2a=\cos^2 a-\sin^2 a.$$
$$\tan 2a=\frac{2 \tan a}{1-\tan^2 a}. \qquad \cot 2a=\frac{\cot^2 a-1}{2 \cot a}$$

Also the following, showing the relations of half arcs or angles :

$$2 \sin^2 \tfrac{1}{2}a=1-\cos a. \qquad 2 \cos^2 \tfrac{1}{2}a=1+\cos a.$$
$$\tan^2 \tfrac{1}{2}a=\frac{1-\cos a}{1+\cos a}. \qquad \cot^2 \tfrac{1}{2}a=\frac{1+\cos a}{1-\cos a}.$$

It is also required to demonstrate the following formulæ, which are necessary to transform the terms into forms fitted for calculation by logarithms :

$$\sin p+\sin q=2 \sin \tfrac{1}{2}(p+q) \cos \tfrac{1}{2}(p-q).$$
$$\sin p-\sin q=2 \sin \tfrac{1}{2}(p-q) \cos \tfrac{1}{2}(p+q).$$
$$\cos p+\cos q=2 \cos \tfrac{1}{2}(p+q) \cos \tfrac{1}{2}(p-q).$$
$$\cos q-\cos p=2 \sin \tfrac{1}{2}(p+q) \sin \tfrac{1}{2}(p-q).$$

Also the following :

$$\frac{\sin p-\sin q}{\sin p+\sin q}=\frac{\tan \frac{1}{2}(p-q)}{\tan \frac{1}{2}(p+q)}.$$
$$\tan p+\tan q=\frac{\sin (p+q)}{\cos p \cos q}. \qquad \cot p+\cot q=\frac{\sin (p+q)}{\sin p \sin q}.$$
$$\tan p-\tan q=\frac{\sin (p-q)}{\cos p \cos q}. \qquad \cot q-\cot p=\frac{\sin (p-q)}{\sin p \sin q}.$$

6 Logarithmic computations.— Nature of logarithms and the system of common logarithms; method of performing multiplication, division, involution and evolution by means of logarithms; arrangement and use of a table of logarithms of numbers; given a number to find from the table its logarithm; given a logarithm to find the corresponding number.

Table of natural sines, tangents, etc.; arrangement and use; given an arc or angle to find from the table the natural sine or other function; given the natural sine or other function to find the corresponding arc or angle.

Table of logarithmic sines, cosines, tangents and cotangents; arrangement and use; given an arc or angle to find from the table the logarithmic sine, cosine or other function; given the logarithmic sine or other function to find the corresponding arc or angle.

7 **Properties of right-angled triangles.**— The six parts of a right-angled triangle; the relation of the two acute angles; the relation of the hypotenuse and the other two sides.

One side is equal to the hypotenuse multiplied by the sine of the opposite angle, or by the cosine of the adjacent angle.

One side is equal to the product of the other side by the tangent of the angle opposite, or by the cotangent of the angle adjacent.

Given the hypotenuse and an acute angle to find the other parts.

Given the hypotenuse and one side to find the other parts.

Given one side and one acute angle to find the other parts.

Given the two sides to find the other parts.

8 **Properties of oblique-angled triangles.**— The relation of the three angles of a triangle.

The sides of a triangle are proportional to the sines of the opposite angles.

The square of a side is equal to the sum of the squares of the other two sides diminished by twice the product of these sides multiplied by the cosine of the angle opposite the first side. That is,

$$a^2 = b^2 + c^2 - 2\, bc \cos A.$$

The sum of two sides of a triangle is to their difference as the tangent of half the sum of the angles opposite is to the tangent of half their difference. That is,

$$a + b : a - b = \tan \tfrac{1}{2} (A + B) : \tan \tfrac{1}{2} (A - B).$$

Given two angles of a triangle and the included side to find the other parts.

Given two sides and the included angle to find the other parts.

Given two sides and the angle opposite one of them to find the other parts.

Given the three sides of a triangle to find the other parts.

To find the area of a plane triangle in terms of the three sides.

9 **Practical applications.**— To determine the height of a tree or column which is accessible and situated on a horizontal plane.

To determine the height of an inaccessible tower above a given level.

To determine the distance between two objects, both visible but inaccessible.

To determine the distance between two inaccessible objects, both of which can be seen from no one point.

To determine the length of a degree of longitude on any parallel.

GROUP 3

SCIENCE

PHYSICAL SCIENCE

Astronomy

Physics
Advanced physics

Chemistry
Advanced chemistry

It is one of the most important duties of the teacher to awaken and guide the curiosity of the child in regard to the phenomena of nature. Instruction should commence in the primary school with simple object-lessons and, always objective, should become more and more systematic as the education of the child progresses. In preparing for these examinations, students thus initiated will avoid the mechanical work of those who begin the study by memorizing definitions and laws, and will form the habit of confirming the knowledge gained from the text-book or teacher by reference, as far as possible, to the objects themselves.

In a paper entitled "The Physical Laboratory in Modern Education," published by the London Educational Times, Henry A. Rowland, Ph. D., of Johns Hopkins University, writes as follows concerning the value of scientific study:

"The study of nature, from the magnificent universe . . . down to the atom of which millions are required to build up the smallest microscopic object, should be the most interesting subject brought to the notice of the student."

"Some are born blind to the beauties of the world around them; some have their tastes better developed in other directions, . . . but there is also a large class of students who have at least ordinary powers and ordinary tastes for scientific pursuits: to train the powers of observation and classification, let them study natural history, not only from books, but from prepared specimens, or directly from nature; to give care in experiment and convince them that nature forgives no error, let them enter the chemical laboratory; to train them in exact and logical powers of reasoning, let them study mathematics; but to combine all the training in one, and exhibit to their minds the most perfect and systematic method of discovering the exact laws of nature, let them study physics and astronomy, where observation, common sense and mathematics go hand in hand."

The ordinances direct that before any educational institution shall be incorporated by the Regents, its promoters must furnish satisfactory evidence of the possession of suitable apparatus. By way of indicating the apparatus best adapted to the needs of academies, instructions were published in 1883. These instructions which deal principally with physical and chemical apparatus are now under revision. It is not designed nor expected that the means of illustrating science shall be confined to physics and chemistry. Each department of science should be provided with a suitable equipment of apparatus. For astronomy and physical geography, the school requires maps, globes and charts. For botany it requires charts, showing the characteristics of plant life, and a collection of specimens gathered and prepared whenever possible, by the students themselves. For zoology and physiology and hygiene, in like manner, the school should be provided with charts to show the leading facts of animal structure and growth. To these should be added a collection of specimens of animal life, gathered and prepared as far as possible by the members of the classes, from the *fauna* of the vicinity. The same plan will serve to create a useful and serviceable collection of specimens to illustrate geology. In all these cases the aim should be to make the formation and increase of the collections the means of inspiring and stimulating the student.

Astronomy.—What may fairly be attempted in the study of astronomy in an academy is to acquire correct notions as to the methods and results of astronomic research. The intricate and extensive mathematic investigations which the development of the subject requires, and the full description of the delicate and complicated instruments and processes of astronomic observation must be left to the special student of astronomy. The progress of discovery in this branch is so rapid that candidates must be warned against relying on old editions of works for their facts, or even on the newer editions, unless supplemented by the freshly gathered information which the teacher may supply.

The student should acquaint himself with the principal facts as given in his text-book and verify them as far as possible by actual observation. Whenever practicable, he should avail himself of the aid of suitable instruments. He should have a knowledge of the constellations sufficient to enable him to recognize readily the more conspicuous stars and their principal configurations. This will require an actual study of the sky during different parts of the year. Observations should be supplemented by continual reference to a good star-map.

The subjoined summary will show the principal directions in which the study should be pursued. In addition thereto candidates should have some knowledge of the early history of astronomy and of the principal constellations.

1 **Celestial sphere.**— Its several circles; corresponding circles on the earth; the zodiac and its signs; the horizon, equinoctial and ecliptic with their systems of circles, points and measurements.

2 **Solar system.**— General structure.

Sun: Its size, distance and weight; its physical constitution; the photosphere, the chromosphere; the solar spots and the rotation of the sun; the sun's heat and its sources.

Earth: Shape and size of the earth; the equator and poles; latitude and longitude, and the system of lines by which they are indicated; the rotation of the earth on its axis and the succession of day and night; the revolution around the sun and the changes of seasons; precession of equinoxes; aberration of light.

Moon: Its size and distance; its orbit and motions; the lunar day; the physical constitution of the moon; the atmosphere of the moon; the light and heat of the moon; phases of the moon; eclipses of the moon, how caused; eclipses of the sun, how caused, their classification; the phenomena attending total eclipses of the sun; prediction of eclipses of the sun and moon; frequency and recurrence of eclipses.

Planets: Terrestrial [interior] — Mercury, Venus, Earth, Mars.
Major [exterior] — Jupiter, Saturn, Uranus, Neptune.
Asteroids [minor planets] — about 300.

The apparent and real motions of the planets; sidereal and synodic periods; distances from the sun; axial rotation; inclination of axis and orbit to the ecliptic; nodes; aphelion and perihelion; magnitude, mass, density, appearance and aspects; telescopic appearance of surface; satellites, their discovery and number; supposed intramercurial planets; the transits of Mercury and Venus; mode and object of observing them; their recurrence; the discovery of Uranus and Neptune; of the rings of Saturn.

The first discoveries of asteroids; Bode's law; the later discoveries of asteroids; hypotheses as to the origin of asteroids.

Comets: Their appearance and form; their physical constitution; orbits and motions of comets; number of comets; accounts of remarkable comets.

Meteoric bodies: Shooting stars; August and November showers; explanation of the phenomena of meteors; meteorites, their chemical and physical constitution.

3 **Stars and nebulæ.**— The magnitudes, distances and groupings of the stars; the motions of stars; double, multiple and variable stars; nebulæ, their classification and description; the nebular hypothesis; application of the nebular hypothesis to the sun.

4 **Universal gravitation.**— Newton's discovery; the law of

gravitation; curvilinear motion; Kepler's three laws of planetary motion; effects of gravitation in producing tides: semi-diurnal, spring and neap tides; the figure of the earth.

5 **Practical astronomy.**— The telescope, account of its invention; the refracting telescope; the achromatic telescope; principal great refracting telescopes; the reflecting telescope, its construction and relative efficiency; principal great reflecting telescopes; the meridian circle and the measurements made with it; measurement of time; mean time, apparent time; determination of latitude; determination of longitude, telegraphic method.

Celestial distances; parallax and the solar parallax; measurement of the distance of the sun; parallax of the fixed stars and their distances.

The spectroscope: Kirchhoff's discovery; physical constitution of the sun, stars and nebulæ; celestial photography.

Physics.[*]— The examinations in physics and chemistry will call for discussions, illustrations and proofs of facts and theories. Reason, judgment and common sense will be considered more important than memory. The school should not be the place where the student receives his education but where he acquires the power and the habit of right thinking. Candidates should be taught to see the phenomena of every-day life in the light of their knowledge of physics and chemistry. This will necessitate a course of experiments which is calculated to develop the explanation of such phenomena as daily come under their observation. Special attention should be given to the construction of simple illustrative apparatus and to the correlation of subjects.

The following summary will serve to indicate the requirements for the examination in elementary physics:

1 **Matter and force.**— Familiar illustrations calculated to develop ideas of the molecular constitution of matter and of molecular force, including such topics as the solid, liquid

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[*] The requirements in physics and chemistry were revised by Professor John F. Woodhull of New York city.

and gaseous states, and the relation of heat to these; cohesion; crystallization; capillarity; solution; absorption of liquids and gases by solids; absorption of solids and gases by liquids; diffusion and osmose, etc.

Simple and compound substances; physical and chemical changes; indestructibility of matter; the correlation of physics and chemistry.

Familiar illustrations and applications of the principles of momentum, gravitation and the three laws of motion, including such topics as the movement of the heavenly bodies; the composition and resolution of forces; the composition of parallel forces and the application of the principle to levers, pulleys, muscular movements, the wheel and axle, balances, devices for illustrating centre of gravity and the stability of bodies; rotation about the shortest axis; uniformly accelerated and retarded motion; the path of projectiles; the pendulum and its uses; the recoil of a gun; the motion of the lawn-sprinkler, etc.

Discussion of the doctrine of conservation of energy applied to machines and to various forms of molecular energy.

2 **Dynamics of fluids.**— Pressure in liquids and gases; the barometer and its applications; transmission of the pressure exerted on fluids.

Application of principles to the siphon, pumps, springs and artesian wells, methods for supplying cities with water, the hydrostatic press, pneumatic tubes, respiration and the circulation of the blood.

Discussion of buoyancy and specific gravity.

3 **Heat.**— Sources of heat such as friction, chemical action, etc.; effects of heat on solids, liquids and gases in producing expansion, liquefaction, vaporization, etc.; measurement of heat with reference to temperature and quantity; diffusion of heat in solids, liquids and gases by conduction, convection, etc.; transformation of heat into potential energy and of potential energy into heat; the relation between heat energy and mechanical work.

Discussion of principles as illustrated in such topics as ventilation; heating of houses by steam, hot water and hot air; winds; ocean currents; freezing mixtures; animal heat; weather phenomena, etc.

Advanced physics.— The attention of candidates should be directed to the following summary:

1 **Electricity and magnetism.**— Electric energy produced by friction; positive and negative electricity; attraction and repulsion; conductivity; insulation; induction; effect of points; lightning.

Magnets; distribution of the force in a magnet; polarization; attraction and repulsion; magnetic induction; the magnetic needle and its variations; the dipping needle; the earth as a magnet.

Electric energy produced by chemical action; polarization in a battery; amalgamation of the zinc; effects of a current on a magnetic needle; electro-motive force; resistance of conductors; electric measurements; transformation of electric energy into heat and light; chemical effects produced by a current; attraction and repulsion of parallel currents; induced currents; electro-motive force of induced currents; divided circuits; electro-magnets.

Application of principles to the telegraph, the electric bell, the telephone, the storage battery, the arc light, the incandescent light, the dynamo, the electric motor, electrotyping, electroplating, etc.

2 **Sound.**—Production of sound; its transmission in solids, liquids and gases; velocity of sound; reflection of sound; echoes; reinforcement of sound; interference; nodes and antinodes; forced and sympathetic vibrations; intensity, pitch and quality of sound.

Application of principles to the vocal organs, the ear, the phonograph, musical instruments, etc.

3 **Light.**— Energy of light; methods of comparing the illuminating powers of two sources of light; explanation of images and shadows; umbra and penumbra; reflection of

light; refraction of light; mirrors, prisms and lenses; the spectrum; color; correlation of heat, light and chemical rays; discussion of the theory of radiation from the sun in connection with first law of motion.

Application of principles to simple and compound microscopes, the telescope, the stereopticon, the eye, the rainbow, eclipses, phases of the moon, etc.

Chemistry.— The examinations in chemistry follow the general plan of those in physics. The elementary chemistry embraces the first half of the subject, the advanced chemistry, the second half. The attention of teachers and candidates is directed to the general introduction to the physical sciences; to the introduction to physics and to the following summary:

1 **Chemistry of the air.**— Effects of excluding air from a flame; effects of air on iron at ordinary temperatures; at high temperatures; various ways of protecting iron from the action of the air; increase of weight when iron is acted on by the air; the weight of the product of a burning candle compared with the amount lost by the candle; portion of the air used up when any thing burns in a closed vessel.

2 **Oxygen.**— Preparation of oxygen; its action on charcoal at ordinary temperatures and at high temperatures; on sulphur, phosphorus, etc.; products of this action compared with those obtained by burning these substances in air; ordinary combustion; kindling temperature; heat of combustion; chemical energy; oxides; oxides in nature.

3 **Hydrogen.** — Preparation by the action of an acid on a metal; comparison of its physical and chemical properties with those of oxygen; burning of hydrogen in oxygen or in air, and burning of oxygen or air in hydrogen; product of this combustion; formation of this product in ordinary combustion and in respiration; heat and chemical energy of the combustion of hydrogen.

4 **Chemistry of water.**— Electrolysis of water; formation of water by passing hydrogen over heated oxides; composition of water by volume and by weight; decomposition of

water by passing steam over heated metals or heated carbon; water gas; oxidation and reduction; natural waters; impure waters; tests and methods of purification.

5 **Nitrogen and its compounds.**— The nitrogen of the air; preparation of ammonia; its combination with water; mechanical mixtures and chemical compounds; preparation of nitric acid; use of sulphuric acid in making acids from salts; unstable character of nitric acid; unstable character of nitrogen compounds as illustrated by explosives and by all organic compounds containing nitrogen; unstable character of ammonium nitrate and of nitrous oxide; nitrogen peroxide and nitric oxide as oxidizing and reducing agents.

6 **Chlorine and its compounds.**— Preparation of chlorine from "bleaching powder"; bleaching; disinfecting; preparation of chlorine from hydrochloric acid; formation of hydrochloric acid by burning hydrogen in chlorine or chlorine in hydrogen; affinity of chlorine for metals; chlorides in nature; formation of hydrochloric acid by the action of sulphuric acid on common salt; its solution in water; action of hydrochloric acid on metals; formation of sodium chloride by the action of hydrochloric acid on baking soda; definite proportions; acids, bases and salts; chemical nomenclature; symbols and formulæ; reactions; equations; effects of light, heat, electricity and solution on chemical action.

7 **Bromine, iodine and fluorine.**— Comparison with chlorine in methods of preparation, in properties and in compounds; etching on glass.

8 **Sulphur and its compounds.**— Occurrence of sulphur in nature; extraction from its ores; its behavior at different temperatures; its crystallization by fusion and by solution; its amorphous condition; its affinity for oxygen; its comparatively low kindling temperature; its use in making matches; its affinity for metals; preparation of iron sulphide by heating sulphur and iron filings; preparation of hydrogen sulphide by treating a sulphide with sulphuric acid; the instability of hydrogen sulphide; its use as a reagent; tests for its presence in eggs, coal-gas, sulphur-spring water, vul-

canized rubber, etc.; products of the combustion of hydrogen sulphide in air or in oxygen; the manufacture of sulphuric acid from sulphur dioxide; its importance; preparation of sulphur dioxide from sulphuric acid by means of copper; its bleaching properties; atomic theory; theory of valence.

Advanced chemistry.— The attention of candidates should be directed to the following summary:

1 **Carbon.**— The instability of organic things; their use as fuels; their liability to decay; the charring of organic substances; the affinity of charcoal for oxygen at ordinary and at high temperatures; products of the union; limewater test; presence of hydrogen in organic things as shown by the formation of water in combustion; relative kindling temperature of hydrogen and carbon; smoky flames; lampblack; destructive distillation; manufacture of illuminating gas; coke; formation of coal, petroleum and natural gas; diamond; graphite; carbon as a reducing agent; its use in extracting metals from their ores; charcoal filters; oxidation and reduction products as illustrated in combustion, decay, the life processes of animals and plants, and destructive distillation from a retort or in the earth; carbon monoxide in coal fires; in water gas; marsh gas; ammonia from compost heaps; marsh gas in coal mines; "fire-damp" and "choke-damp"; carbon dioxide in respiration; comparison of respiration of animals and plants; use of hemoglobin and chlorophyl; ventilation; reason why carbon dioxide will neither burn nor support combustion; study of flames; heat and chemical energy of the combustion of carbon; application of this energy in doing mechanical work; fermentation by yeast; soaps.

2 **Phosphorus and arsenic.**— Characteristics of phosphorus and arsenic; affinity of phosphorus for iodine; for oxygen; use in making matches; allotropism as illustrated by phosphorus, carbon, sulphur and oxygen; phosphoric acid and its salts.

Monobasic, dibasic and tribasic acids; acid, neutral and normal salts.

Properties of arsenious oxide; Marsh's test for arsenic; the nascent state as illustrated by the action of chlorine from *aqua regia*, sulphur from hydrogen sulphide, hydrogen in Marsh's test, the action of oxidizing and reducing agents etc.; products of the complete combustion of hydrogen arsenide, carbon bisulphide, hydrogen sulphide and a hydrocarbon like kerosene; products of the incomplete combustion of the same when cool objects are brought into the flames; the affinity of oxygen for these elements in the free state compared with its affinity for them in the combined state.

3 **Important metals and their ordinary compounds.**— A brief study of the properties of the following metals and a few of their ordinary compounds,— potassium, sodium and [ammonium]; calcium; zinc, copper, mercury and silver; aluminium and iron; lead and tin, platinum and gold.

Gunpowder; baking powder; hard water; mortar; glass; the smelting of ores; steel; porcelain; the common alloys.

4 **Qualitative analysis.**— A sufficient study of qualitative analysis to enable the candidate to give the successive steps in the process of analyzing an unknown solution containing any of the following metals,—silver, lead, copper, arsenic, iron, zinc, calcium, sodium, potassium and [ammonium], also the following acids,— HCl, HNO_3, H_2SO_4, H_2CO_3.

This work is intended to equip the student not so much with the facts of qualitative analysis as with the underlying principles. He should be taught first of all the methods of separating the elements into groups and of distinguishing the individual members of each group.

GROUP 3 CONTINUED

GEOLOGIC SCIENCE

Geology	Physical geography

[*See the general introduction to the physical sciences — page* 63]

Geology.— It is desirable to make the study of geology illustrate and receive its illustration from the surrounding country. Hence, while pursuing this subject, it will be a great stimulus to the study and a great help in comprehending it, to examine the structure of the earth in the vicinity, and to find there facts corresponding to the statements of the text. Every teacher should encourage students to collect geologic specimens, and form for themselves and for the institution illustrative cabinets. He should visit with them localities which may furnish illustrations of geologic operations. They may thus be taught that geologic forces are still at work and that the phenomena which are found in the rocks of a past age are the result of laws identical with those which now prevail. The study should cover the following particulars:

1 **Rocks.**— Their composition; minerals composed chiefly of silica, including the different forms of quartz, feldspar, mica, hornblende, etc.; minerals composed of the carbonates and sulphates of lime; minerals composed of alumina; ores of iron, of copper and of lead; carbon.

The characteristics of the most abundant rocks; fragmental and crystalline limestone; sandstone; conglomerate; shale; argillaceous sandstone; slate; granite; gneiss; mica schist; syenite; volcanic rocks.

The structure of rocks; stratified rocks; unstratified rocks; columnar structure.

2 **Geologic forces.**— Formation of rocks by fusion; by chemical agencies; sedimentary rocks, as derived from the

wear of pre-existing rocks ; rocks formed by water depositing solids and by solution and suspension ; mechanical agency of water in forming rocks ; rocks formed from organic remains ; limestones formed from shells, corals, crinoids and foraminifers ; silicious rocks of organic origin ; formation of peat-beds and coal-beds.

Effect of air and moisture on the rocks ; the chemical action which takes place.

Effect of winds in shifting sand.

Effect of dew, rain, rivers ; degradation of mountains ; sediment carried down by rivers ; formation of deltas ; alluvium.

Effect of the ocean ; the tides, their effect ; the waves, their effect on the shore ; their destruction of corals, of mollusks ; the currents of the ocean ; sedimentation ; the production of water-marks on sedimentary rocks.

Effects of frost and ice ; destruction of rocks by freezing ; transportation of rocks by ice.

Glaciers, their constitution, phenomena and effects ; glacial action ; indications of glacial action in past geologic ages.

Effects of heat ; expansion and contraction ; fusion of rocks ; volcanoes ; volcanic mountains ; solidification of loose material by heat ; change of the form of rocks by heat ; interjected veins.

3 **Earth's surface modeled by geologic forces.**— Formation of valleys by the erosion of rivers ; cañons ; illustrations of erosion by rivers in New York.

Valleys resulting from upheaval ; valleys produced by fractures in the earth's surface and by subsidence.

Mountains produced by ejection of igneous material ; mountains left by the erosion of the valleys ; upheaval and flexure of the earth's crust ; dipping and folded strata ; fractures and faults ; unconformable strata ; causes producing the flexure and fracture of strata ; elevation of continents ; formation of lake-beds ; depression of ocean-beds.

4 **Historic geology.**— The succession in the formation of the rocks of the earth ; change in the climate and its effects ;

the succession of species of vegetable and animal life; fossil remains in successive strata.

Divisions of geologic history; archæan or eozoic time; paleozoic time; mesozoic time; cenozoic time.

Archæan time: Condition of the globe and, more particularly, of the American continent during this time; the rocks of the archæan time; evidence of the existence of plants and animals in this time.

Paleozoic time: Cambrian or Primordial rocks, and the plants and animals found therein.

Lower and Upper Silurian rocks, the plants and animals found in them; progress of the American continent during the Silurian age.

Devonian age, its characteristic rocks; the North American continent during the Devonian age; the plants and animals prevailing in it.

Carboniferous age: the rocks peculiar to it; the coal period; the coal measures; the varieties of coal; origin and formation of coal; plants of this age; animal life on land and in the sea; changes in the North American continent; the formation of mountains.

Mesozoic time: The rocks characteristic of the mesozoic time; the Triassic; the Jurassic; the Cretaceous; their prevalence over the North American continent; the plants; the animals; appearance and prevalence of reptiles; characteristic reptiles; mountains added to the continent.

Cenozoic time: Comprising the Tertiary age and the Quaternary age; divisions of the Tertiary; the North American continent and its mountains during the Tertiary age; the plants and animals of the Tertiary; their resemblance to those of the present time; the climate of the Tertiary age.

Quaternary age: Divisions of the Quaternary; the Glacial period; the prevalence and effects of glaciers; glaciers in North America during the Quaternary; causes of the cold during this period; the Champlain period; the melting of the glaciers and the deposit of drift; the deposit of alluvium; the changes in the North American continent; the Recent period; the formation of terraces.

The plants characterizing the Quaternary age; their similarity to those now existing; the animals of this age; their character, as compared with existing types; the gigantic proportions of certain species.

The first indications of the existence of man; the relics of man; stone implements, marked bones and shells, pottery, charcoal remains of fires, human bones, etc.

Periods of maximum development of various classes of plants and animals, and their decadence.

Present geologic work in progress; formation of rocks; destruction and disappearance of species of plants and animals; changes in the physical features of the earth; action of volcanoes and earthquakes.

Physical geography.— The study of physical geography is properly restricted to the physical features of the globe and to the vegetable and animal life upon it. It deals incidentally with the political divisions of the earth, and with its geologic and astronomic relations. It follows in natural sequence the study of descriptive geography and is so intimately connected with it that it is nearly impossible to define the limit between the two subjects. For its adequate comprehension physical geography requires the exercise of the best powers of the student. The subject can not be mastered by the cursory reading of a text-book or by listening to a course of lectures. The problems are varied and profound, and will demand close study, and all the help that can be gathered from books, teachers and personal observation.

The following summary indicates what may be found in the principal text-books on this subject, and what will be assumed to be within the knowledge of the candidates who present themselves for examination:

1 **General description of the globe.**— Its size, form and mass; its relations to the sun and moon; the two principal motions of the earth and their effect on its physical condition.

The astronomic and geographic circles of the earth; the division of the globe into zones; latitude and longitude, and the differences of time.

The magnetic properties of the globe and the variation in the manifestations of these properties in different parts.

The internal heat of the globe, and its effect in producing warm springs, volcanoes and earthquakes; nature of volcanoes and their prevalence; principal volcanoes; nature and occurrence of earthquakes; principal destructive earthquakes.

2 **Land surface.**— General form of the land masses of the globe, horizontal and in relief; mountains and mountain chains; plains; plateaus; valleys.

The structure of the great divisions of the globe; North and South America; Europe; Asia; Africa; Australia.

Islands; volcanic islands; coral islands and their mode of formation.

3 **Water surface.**— The ocean, its composition and temperature; the form, extent and depth of the several oceans; the waves of the ocean, how produced; the tides, the causes and laws of their recurrence.

The currents of the ocean; their causes, directions and extent; their influence on climate.

Lakes, their formation and extent; their distribution; salt lakes; the lakes of the United States and British America; the lakes of the state of New York.

Rivers, the sources of rivers; water-sheds; the river systems and drainage of North America; of South America; of Europe; of Asia; of Africa; the navigable rivers and lakes of the United States, and particularly of the state of New York.

4 **Atmospheric phenomena.**— Composition and properties of the atmosphere; decrease in density at higher altitudes; effect of decreased density on vegetable and animal life.

Climate as dependent on the distribution of the heat of the sun; climate as affected by altitude, by influence of winds, by proximity of water, by plains and mountains;

representation of climate by isothermal lines; the course of isothermal lines across the several land divisions of the globe.

Winds, how caused; periodic winds; the regions where they occur; region of calms; region of trade winds; monsoons, the sirocco, the simoon; land and sea breezes.

Storms, their physical causes; the laws of the motion of storms; the movement of storms across the United States and the Atlantic ocean; violent storms; West India cyclones; the Chinese typhoons; the Mauritius hurricanes; tornadoes and water-spouts.

Vapor in the atmosphere, its source; point of saturation; deposit of dew; clouds of various forms; the fall of rain; what brings rain; periodic rains in various regions, how caused; rains of the tropical regions; rains of the trade-wind region; causes of arid regions.

Snow, its formation; regions of perpetual snow; the snow line; glaciers, their formation and motion; moraines; icebergs.

5 **Distribution of minerals.**— Gold, silver, iron, copper, lead, zinc, platinum, mercury, tin, salt, coal, diamonds, and the principal building stones.

6 **Distribution of plants.**— Influence of latitude; influence of altitude; influence of humidity; the distribution of useful plants; the limits of the cultivation of cereals; the food plants of the globe; the plants used for making clothing.

7 **Distribution of animals.**— The characteristic animals of the different regions of the globe; domesticated animals; animals furnishing food and clothing.

8 **Races of man.**— Their characteristics; their origin, location and extent; the Caucasian race; the Mongolian race; the African race; the Australian race; the Malay race; the American race; modifications produced by climate, food and intellectual culture.

GROUP 3 CONCLUDED

BIOLOGIC SCIENCE

Botany **Zoology**
Physiology and hygiene

[*See the general introduction to the physical sciences — page* 63]

Botany. — In the examination on this subject it will be assumed that the candidate has a knowledge of the organs of a plant and of the mode in which these organs are developed from the seed; a knowledge of the general principles of classification and the application of this classification to the common plants of the country, both wild and cultivated.

The study of germination and growth may be made interesting and profitable by requiring members of the class to soak typical seeds and then dissect them; also to plant seeds in absorbent cotton, observe the germination and growth of the plantlets for several days, and write reports of their observations to be read before the class.

In addition to the special topics mentioned below, the candidate will be expected, in the examination, to describe distinguishing characteristics of the common plants in the garden and field, and to make drawings of parts required. It will be assumed that the candidate has acquired this knowledge largely by his own observation.

The following plants were selected by the State Botanist, as representatives of important orders found in New York, and are recommended for special study:

Buttercup
Catnip
Common Brake
Common Chickweed
Common Plantain
Common Polypode
Couch Grass
Dandelion
Field Sorrel
Golden-rod
Horse-chestnut
June Grass
Oat
Pea
Polygonum Pennsylvanicum
Purple Trillium
Red Clover

Shepherd's Purse
Strawberry
Sugar Maple
Timothy
Toad-flax
Wheat
White Daisy
White Elm
White Oak
White Pine
White Violet
White Willow
Wild Carrot
Yellow Foxtail
Yellow Pond-lily

1 **Germination and growth.**— The seed, its life; the growth and sustenance of the young and mature plant; how it obtains its food; the absorption, conveyance and assimilation of food; the effects on the air of growing plants; influence of forests on the rainfall; relation of light, heat and moisture to plants.

2 **Periods of plant life.**— Annuals, biennials, perennials woody and herbaceous, shrubs, trees, bushes.

3 **Propagation of plants.**— By seeds, by buds, by grafting, by layering; of cryptogams by spores.

4 **Leaf.**— Simple leaf, its parts, kinds, venation, margin, form, apex, base, color, surface, position; compound leaf, its parts, varieties.

5 **Flower.**— Parts, form; inflorescence, parts, varieties, attitude.

6 **Fruit.**— Fleshy fruits; dry fruits; stone fruits.

7 **Roots.**— Their form and kinds; air plants; parasitic plants.

8 **Stems.**— Appendages; forms, kinds, attitude; internal structure.

9 **Classification of plants.**— Of phenogams, of cryptogams, of exogens, of endogens, of angiosperms, of gymnosperms.

10 **Uses of plants.**— For medicine, for clothing, for food, for shelter.

11 **Shade and forest trees.**— Kinds and varieties; climatic influences; geographic distribution; uses.

DIRECTIONS FOR DRYING, PRESSING AND MOUNTING BOTANIC SPECIMENS

To accomplish much in the study of plants, an herbarium of at least one hundred plants should be prepared. The benefit derived from the careful preparation of botanic specimens can not be too highly estimated.

One can scarcely hope to remember the characteristic properties and botanic names of any great number of plants of the neighborhood without the drill acquired in preparing an herbarium. Were a class to analyze one hundred wild flowers during a spring, without preserving any, when spring comes again they would find it difficult to recall the name of a single plant. But, if the specimens have been carefully pressed, named and mounted, their names will become familiar terms, and will remain a permanent possession.

A few directions for drying, pressing and mounting botanic specimens are here given.

1 **Drying and pressing the specimen.**— For drying and pressing specimens, a supply of soft, unsized paper is necessary. Newspapers answer the purpose very well. At least one hundred sheets, not less than sixteen by twenty inches, will be needed. Wire presses are most convenient; but where these can not be had, a good press may be made with boards and weights. Take two boards, each somewhat larger than the sheets of paper; place one of these on the floor, and on this half a dozen sheets of the paper. On this paper place a plant to be pressed, being careful to smooth out every leaf and petal. Since it is desirable to remove the moisture from the plant as soon as possible, at least half a dozen of the sheets should be placed between this and the next plant. These papers absorb the moisture from the specimens. The delicate parts of the flower can be better cared for, in drying, by placing thin sheets of cotton wool between them and the paper. Successive plants and paper may be added, until all are in the press, when the other board is placed on the pile. If many plants are in the press, a heavy weight — not less than fifty pounds — should be placed on the board. If the plants are few and delicate, a lighter weight is better. After the plants have been in the press about twenty-four hours, the weight and board are removed, and fresh drying papers substituted for all *except the ones next to and inclosing each plant;* these should not be disturbed until the specimens are dry. Pressure is applied once more for a period of from two to three days, when the papers are changed again. Unless the plants are quite juicy, they may now be left in the press until sufficiently dry to mount. One week from the time the plants are first placed in the press they may be mounted.

2 **Mounting the specimen.**— The sheets of paper on which the specimen is to be mounted should be eleven by sixteen inches. This is the standard size used by all botanists. Paper as thin and light as ordinary foolscap will break too easily. The paper used by the State Botanist is termed tobacco paper. This paper may be obtained of large dealers and cut to the proper size. Beginners will find it best to fasten the botanic specimens to the sheet with white thread, sewing through the paper and tying on the back of the sheet. Light specimens may be stuck to the sheet with glue or with a good paste. Mucilage should not be used.

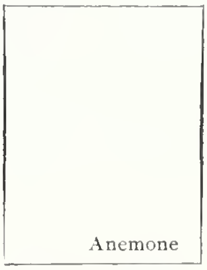
3 Labeling the specimen. — On the right-hand lower corner of the sheet a suitable label should be placed. It need not be pasted except by the right-hand end. The label should be five by seven and one-half centimeters. On this is written the owner's name, the botanic name of the plant, its common name, its locality, by whom collected, and when. A sample label is here given; these may be obtained for one dollar per thousand.

Botanic name
....
Common name
....
Locality
....
Col. by.. Date..
Herbarium of...

Care should be taken that the name of the genus in all cases commence with a capital and that of the species (unless it be derived from a proper noun; *e. g.*, Erythronium Americanum) with a small letter.

Duplicate specimens intended for exchange are labeled as the others, except the first line, which is left blank for the future owner's name.

All plants of the same genus should be placed in a genus cover made of heavy brown paper. Manila paper is commonly used. This cover should be a little larger than the sheets on which the plants are mounted. The name of the genus is written on the right-hand lower corner of the genus cover, as shown in the cut.



Zoology.— It is suggested that teachers procure a few typical forms belonging to each branch of the animal kingdom, and by means of dissections before the class, or better still, *by* the class, give students an accurate and a fairly complete knowledge of these few forms. When a student has once carefully studied in this way a half dozen animals ranging from the lower orders to the higher, he will have a far better knowledge of the animal kingdom than he could possibly gain by committing a text-book to memory.

Too much emphasis can not be laid on the importance of studying this subject from practical observation rather than from books. In the detailed study of the animal kingdom it will therefore be most profitable to use the familiar animals as types, and investigate the structure, organs, habits and other characteristics of these as illustrative of the classes to which they belong.

Thus it is recommended that special attention be given to those classes which are found within the limits of the state of New York, and particularly to such as are common in the locality where the school is situated ;— of the insects, those which are injurious to vegetation, or are noxious to men and animals, or, like the silk-worm and the honey-bee, are useful to man ; — of the reptiles, those which inhabit the locality ; — of fish, those which are used for food and those which are propagated artificially ; — of the birds, those which are domesticated, or valued as game, or which are our summer visitors ; — of quadrupeds, those which are our faithful friends, or which furnish us food, or are hunted as game or as vermin.

It should be made a special object in this study to prepare for the cabinet, specimens of the different orders of animals. This work has for the student intense interest, and serves to fix the peculiarities of the structure and organs of the animals indelibly on the memory. A cabinet prepared in this way for a school is far more valuable than one which has been purchased ready mounted.

It is recommended also that the student be at once set to draw from nature the animal forms which he studies. Nothing will develop more surely a habit of close observation than the effort to make drawings of the things observed and no more effectual method of teaching drawing can be devised.

A very complete collection of marine animals for laboratory use, illustrating every branch of the animal kingdom, may be obtained at a trifling outlay. Zoological charts will also be found valuable in giving interest and impressiveness to the instruction.

Many of the text-books on zoology begin the treatment of the subject with the lower forms of life, because in these the structure and functions are more simple. Specimens of these lower animals can be obtained in every locality, and being usually small, can more readily be used for study. Common snails ; mussels ; clams and oysters ; moths, butterflies and beetles ; bees, wasps and houseflies will furnish specimens for the study both of external peculiarities and of internal structure.

The reverse order which is followed in some of the books in common use has the advantage of bringing the student at once to the consideration of those departments of the animal kingdom which have for him the greatest interest. In either case, it will be important to preface the detailed study of the several classes of animals by an introductory investigation of those principles which are common to all forms of animal life.

It is important for the student to obtain just conceptions of the following particulars:

1 **Animals and plants.**— The doctrine of evolution as applied to plants and animals.

The development of the adult animal from the egg, as well as the metamorphoses through which certain lower forms of animals pass in their development.

The difficulties attending attempts to assign with certainty the limits between plants and animals.

2 **Classification and structure.**— The general principles of the classification of the animal kingdom into its various subdivisions.

The general structure of animals and the different forms of tissue which are found in animals. The mode in which these vary as we pass from the simpler to the more complex forms of life.

3 **Organs and their functions.**— The organs of animal life and their functions, and the arrangement of the organs in different classes of animals; the organs of digestion,— mouth, teeth, stomach ; the organs of circulation ; the organs of respiration ; the nervous system ; organs of the senses.

The correlation and adaptation of these organs to the varying habits and environments of the animals.

The homologies and analogies which may be traced between the organs of different classes of animals ; comparison of these organs with those of man.

The mode in which the organs of different animals do their work.

The instincts of animals, as well as the conscious or automatic movements which characterize the lower forms of animal life.

Physiology and hygiene.— Nothing can be of more importance to our comfort, our usefulness or even our mental improvement than a knowledge of the structure of the body and of the fundamental laws of health. Instruction in physiology and hygiene should follow the objective method. Illustrations such as charts, a manikin, the rough dissection of organic tissue and structure, and the microscopic study of the finer tissues and cell-structures of both plants and animals, are necessary if students are to gain correct ideas of the subject.

The time which an academic course allows for this subject may be spent profitably on the following points :

1 **Framework of the body.**— The bones ; their form, structure and chemical composition, their growth and repair, their strength ; the skeleton ; the names of the principal bones ; the joints.

2 **Muscles.** — Their structure and composition ; their strength, mode of growth and action ; voluntary and involuntary movements of the muscles ; necessity for exercise, and its effects ; forms of exercise.

3 **Skin.**— General office of the skin and its structure; its appendages; perspiration; importance of bathing; kinds of baths; times for bathing; clothing, its importance, material, color, adaptation to season of year, to day and night.

4 **Food.**— The essential elements of food; quality of food; utility of a mixed diet; vegetable and animal food; necessity of a regular diet; nutritious foods; water, its impurities; tea, coffee and chocolate, their effects, beneficial and injurious; alcohol.

5 **Digestion.**— Teeth, their general character, number and composition; their development and growth; the two sets, their names, number and location; the cause of their decay; their preservation; the filling of teeth; salivary glands, their office, number, location and names; composition of saliva and its action; the esophagus; the stomach and its general anatomy; the gastric juice and its action; the intestines; the bile and pancreatic juice, their action; the system of absorbents; the waste of the body; conditions influencing digestion.

6 **Blood.**— The amount of blood in an average human body; composition of blood; office of blood; transfusion.

7 **Circulation.**— The general anatomy of the heart; pulsation; general anatomy of the arteries and veins; course of the blood through the heart, arteries, capillaries and veins; names of the principal arteries and veins; forces which cause the blood to circulate; rapidity of circulation of the blood; injuries to blood-vessels; the chemical changes which the blood undergoes during its circulation; difference between venous and arterial blood.

8 **Respiration.**— The lungs, their general anatomy; their capacity; office of the lungs; chemical changes attending respiration; respiratory movements; difference between expired and inspired air; the composition of air; its impurities; the effects of impure air; ventilation; animal heat.

9 **Nervous system.** — Sensation; motion; volition; structure of the nervous system; the white and gray substances; the distribution and functions of the nerves in the human

body; the functions, location, structure and divisions of the brain; the spinal chord, its functions and branching nerves; the sympathetic system; exhaustion and sleep.

10 **Special senses.**—

Sense of vision: The anatomy of the eye; the functions of the different parts of the eye; the defects of sight, and their remedies; short and long-sightedness; color-blindness.

Sense of hearing: The anatomy of the ear; functions of the different parts of the ear.

Sense of touch: Its location; organs of touch.

Sense of taste: Its location and organs.

Sense of smell: Its location and organs.

11 **Voice and speech.**—The anatomy of the larynx; the vocal cords; the production of voice; the change of voice.

12 **Hygiene.**—The candidate will be expected to answer questions concerning the hygiene of any of the above subjects.

13 **Stimulants and narcotics.**—Alcohol, opium, nicotine, cocaine, caffeine, chloroform, chloral; their various forms; temporary effects of a small dose, of large doses; ultimate effects on organ and tissue; chronic alcoholism; delirium tremens; the craving for narcotics; hereditary effects.

14 **Emergencies.**—Hemorrhage, how controlled temporarily; artificial respiration and other means of resuscitation in cases of asphyxia from drowning, etc.; fainting; epileptic fits; apoplexy; burns, scalds and frost-bites, their immediate treatment; temporary treatment of fractures, sprains and dislocations till submitted to a surgeon; common poisons and simple antidotes.

15 **Contagious and zymotic diseases.**—How caused and how prevented; use of disinfectants.

GROUP 4

HISTORY AND SOCIAL SCIENCE

Geography

Geography.— It is assumed that candidates for this examination have thoroughly studied an ordinary school textbook, including the outlines of mathematic, descriptive, political and statistic, with some of the elements of physical geography; that they are familiar with the ordinary school-maps and with the use of a terrestrial globe; and that they can furnish such map-sketches as may be properly required.

In preparing for the examination in this subject, particular attention should be given to the state of New York and to the United States. Other political divisions should be studied more generally and in proportion to their relative importance. The minds of pupils should not be overburdened with useless details.

As a means of both applying and testing geographic knowledge, candidates should be able to bound important portions of the earth's surface, and to give the approximate direction of one portion or prominent locality from another. Lines of latitude and longitude should be carefully observed as far as they serve as boundaries, or correspond with important places. Candidates should also understand the use of latitude and longitude in determining the true location of places on the earth's surface. They should also know the latitude and longitude of at least Greenwich, Washington, New York city, Albany, and their own residences respectively, as nearly as these have been or may be ascertained. They should understand what is meant by standard time.

Without unduly burdening the memory with numbers, it is important that candidates should have some knowledge of geographic statistics, and be able to form judgments on the absolute and relative extent of geographic distances, areas and elevations. They should be able, for example, to name the oceans and continents or grand divisions respectively, in the order of size, and to give their approximate measure in degrees or miles, or as compared with a fourth or half or the whole of the earth's surface; also to name the largest or some of the largest mountains, plains, rivers, lakes, islands and cities within a given area, and to give relatively the extent in square miles and the population of the states and territories embraced within our Federal Union.

Familiarity with geographic definitions and accuracy as to the orthography of common geographic names are expected.

The following is a summary of important points to which the attention of the candidate should be directed:

1 **Form and size of the earth.**— Proofs that the earth is spheric in shape; the diameter of the earth, equatorial and axial; the circumference of the earth.

2 **Motions of the earth.**— Rotation on its axis, the cause of day and night; revolution around the sun; the earth's orbit.

3 **Directions, positions and measurements.**— The cardinal points; inclination of the earth's axis to the plane of the ecliptic, causes of change of seasons; the principal circles of the earth.

Outline maps of hemispheres, as projected on the plane of the equator and on the plane of the meridian of 20° west and 160° east of Greenwich, with the proper naming and numbering, by degrees, of the usual circles of latitude and longitude.

4 **Land.**— The principal land masses, continental and insular, and their groupings, together with the great mountain systems, plateaus and plains.

5 **Water.**— The several oceans with the seas and large gulfs and bays belonging to each.

The principal river systems, and the inland seas and greater lakes of each continent or grand division.

6 **Political divisions.**— The political divisions of each continent or grand division, with their capitals, chief cities, forms of government and populations ; also the subdivision of the United States by states and territories, with their respective capitals and chief cities ; of the state of New York, by counties, and of the county in which the examination is held, by townships.

7 **Routes of commerce and travel.**— Chief routes of commerce and travel, especially those of our own country and state.

8 **Staple productions.**— Staple productions of different sections of the United States and of different parts of any country.

GROUP 4 CONTINUED

HISTORY

General history

Greek history	**English history**
Roman history	**United States history**

The age at which the majority of the candidates pass their examinations forbids the attempt to carry the study of history into its higher departments of philosophic inquiry.

It seems more judicious to take up particularly the history of those parts of the world which have affected us most nearly, and the literature and institutions of which have contributed most to bring about our present condition. First in importance is the history of our own country ; next is the history of England, of which our own is only a branch. The story of England is the story of the origin of our language, customs, laws and forms of government. Besides, the history of England is intimately connected with the history of the great continental nations, so that more or less proficiency in European history will be acquired from the study of that of England. In the domain of ancient history, by far the greatest interest attaches to Greece and Rome. From them modern civilization has derived many of its fundamental ideas. Their authors are still read in our schools; our literature is full of allusions to their heroes and statesmen, and to their achievements in arts and in arms.

A *general* study of universal history is also of great importance inasmuch as it gives us a connected and related knowledge of the whole field of history.

The subjects for examination in history follow here the natural classification, but it is not proposed to indicate the order in which they should be studied.

General history.— The attention of candidates should be directed to the following summary:

1 **Introduction.**— Division of history into ancient, modern and medieval; the races of mankind and their migrations.

ANCIENT HISTORY

(*From the earliest nations to the fall of the Roman empire in the west*)

2 **Oriental nations.**— The political history, government, religion, arts and general culture of India and China; of Egypt; of Chaldæa; of Assyria; of Babylonia; of the Hebrews; of the Phœnicians; of the Persians.

3 **Greece.**— The heroic age; the religion of the Greeks; colonization; the rise of Sparta and Athens; the Græco-Persian wars; the supremacy of Athens; the Peloponnesian war; the supremacy of Sparta and of Thebes; the Macedonian supremacy and empire of Alexander; the dissolution of Alexander's empire; Greek literature, philosophy and science; Greek architecture, sculpture and painting; the social life of the Greeks.

4 **Rome.**— Early inhabitants of Italy; the legendary kings; the Roman religion; the early Roman republic; the

conquest of Italy; the Punic wars; the last century of the republic; the empire from the battle of Actium to the death of Aurelius; the birth of Christ; the burning of Rome and the persecution of Christians by Nero; the decline and fall of the Roman empire in the west; the conversion of Constantine and the spread of Christianity; Roman literature, philosophy and law; Roman architecture; the social life of the Romans.

MEDIEVAL HISTORY

(*From the fall of Rome to the eleventh century*)

5 **Age of darkness.**— The influence of the fall of Rome on the history of the world; the Teutonic kingdoms; the conversion of the barbarians; the Romance nations; the formation of the Romance languages; the eastern Roman empire; Mohammed and the Koran; conquests of the Saracens; Charlemagne; the restoration of the western empire; the Norsemen; the rise of the papacy.

(*From the eleventh century to the discovery of America*)

6 **Age of revival.**— Feudalism and chivalry; the Norman conquest of England; the crusades and their results; the papal supremacy; the decline of papal power in temporal affairs; Turanian conquests; the Ottoman empire; the fall of Constantinople; the Italian city-republics; the revival of learning and the invention of printing; the national governments and literatures of England, France, Spain, Germany, Russia, Italy, Norway, Denmark and Sweden.

MODERN HISTORY

(*From the discovery of America to the peace of Westphalia*)

7 **New world.**— Discovery of the new world by Columbus; the voyages of Vasco da Gama and Magellan; the conquests of Mexico and Peru; Spanish colonization in the new world.

8 Reformation. — Causes of the reformation; Martin Luther; the inquisition; the Jesuits; the ascendancy of Spain under Charles V and Philip II; the Tudors and the English reformation; the reigns of Henry VII, Henry VIII, Edward VI, Mary and Elizabeth; literature of the Elizabethan era; revolt of the Netherlands and rise of the Dutch republic; the Huguenot wars in France; the thirty years' war.

(*From the peace of Westphalia to the present time*)

9 Period of revolution.— France under Louis XIV; England under the Stuarts; the English revolution; the house of Hanover; French and Indian war in America; the American revolution; Russia and Peter the Great; Prussia and Frederick the Great; the French revolution; the consulate and the empire; the fall of Napoleon and the restoration of the Bourbons; the war of 1812 between England and America; Alexander I and the Holy Alliance; the Russo-Turkish war of 1828–29; revolution in Poland; the Crimean war; the civil war in America; emancipation of Russian serfs; the Russo-Turkish war of 1877–78; nihilism and the exile system; the German confederation; the seven weeks' war between Austria and Prussia; the Franco-Prussian war; establishment of the new German empire; the revolution in Italy; England from the congress of Vienna; progress towards democracy in England; growth of the British empire in the east.

10 New age.— Industrial inventions — steam navigation, railways, telegraphs, electric motors, etc.

Greek history.— It is expected that the candidates in this subject in connection with their reading will consult maps for an explanation of geographic references, and biographic and mythologic dictionaries for a fuller account of the events and actors. We summarize the most important points to which attention should be directed.

1 Geography of Greece.— The geographic location and character of the territory occupied by the Greeks; the political and commercial advantages of their location; the harbors, navigable waters, coast line, soil, climate and great cities.

2 **Legendary history.**— The legendary history of Greece, with accounts of the heroes, Hercules, Theseus, Minos, etc.; voyage of the Argonauts; the Trojan war and the Homeric poems; the return of the Heraclidæ.

3 **Greek people and their national institutions.**— Relations of the Greek states; the Amphictyonic Council; the Olympic and other games; oracle at Delphi.

4 **Peloponnesus and Sparta to the end of the Messenian wars.** — The rise of Sparta and other Doric states; laws of Lycurgus; training and education of Spartan youth; the Messenian wars.

5 **Athens to the invasion of Attica by Cleomenes.**—Attica, its early divisions and government; the laws of Draco; the laws of Solon; despotism of Pisistratus; party struggles in Athens; establishment of democracy; efforts by the Spartans to overthrow the Athenian democracy.

6 **Greek colonies.**— Greek colonies and their relation to the home states; colonies in Asia; colonies in Sicily; colonies in Italy; colonies in Gaul, Spain and Africa.

7 **Persian wars.**— The revolt of Greek colonies in Asia against Persia; aid of the Greeks; burning of Sardis; capture of Miletus.

Persian invasions of Greece; resistance of Athens; battle of Marathon; life and fate of Miltiades; maritime power of Athens.

Xerxes invades Greece; battle of Thermopylæ; battles of Artemisium; capture of Athens; battle of Salamis; the battle of Platæa; league of Platæa; defeat of Persians at Mycale; liberation of the Greek islands.

8 **Supremacy of the Athenians.**— Rebuilding of Athens; Athens as a maritime power; parties at Athens; Athens under Pericles; wars of Athens with Sparta and Bœotia; thirty years' truce with Athens.

9 **Peloponnesian war.**— The causes of the Peloponnesian war; parties engaged in it; the plague at Athens; capture of Platæa; revolt of Mytilene; sedition of Corcyra; varying fortunes of the war; peace for fifty years agreed on between Sparta and Athens; intervention of the Athenians in Sicily; operations at Syracuse.

Revolt of Athenian allies; oligarchic conspiracies; continued operations of the Peloponnesian war; battle of Arginusæ; battle of Ægospotami; investment and capture of Athens.

10 **Thirty tyrants and the death of Socrates.**— The thirty tyrants, their deposition; restoration of democracy; life, impeachment, trial and death of Socrates.

11 **Athens and Greek art.**— The building of the Parthenon and other temples; sculpture, painting and architecture.

12 **Expedition under Cyrus and retreat of the ten thousand.**— The expedition of the Greeks in aid of Cyrus and their retreat under Xenophon.

13 **Supremacy of Sparta.**— Hostilities with Thebes; the Corinthian war; alliance of Athens with Thebes.

14 **Supremacy of Thebes.**— Battle of Leuctra; invasion of Peloponnesus by the Thebans; Epaminondas.

15 **Sicilian Greeks.**— Syracuse; revolutions and changes; Dionysius; Timoleon.

16 **Philip of Macedon.**— Rise of Macedonia; Philip's ambitious designs; the sacred war; its origin and progress; interference of Philip; Demosthenes' Philippics; battle of Chæronea; Philip's death.

17 **Alexander the Great.**— Career of Alexander; his education and character; his invasion of Asia Minor; battle of Issus; battle of Arbela; conquests of Babylon, Susa, Persepolis; invasion of India; his death at Babylon.

18 **From Alexander's death to the Roman conquest.**— Division of the conquered provinces after Alexander's death; government and history of Greece down to the conquest by the Romans.

19 **General topics.**— Government and laws of the Greeks.

Religion of the Greeks.
Trade and commerce.
Art and architecture.
Great statesmen and orators.
Great writers and their works.
Manners and customs of the Greeks.

Roman history.— The following is a summary of the most important points:

1 **Geography and early inhabitants of Italy.**— Geographic description of Italy, its divisions, mountain and river systems, soil and climate; early inhabitants.

2 **Traditional history.**— Traditional history of the foundation of Rome, of the early kings and of the expulsion of Tarquinius.

3 **From the establishment of the republic to the Punic wars.**— The republic; the rule of the consuls; the insurrection of the plebeians and the establishment of tribunes; the decemvirs and the twelve tables; wars with the Volscians and Gauls; political agitations and the resulting changes in the government.

Wars with the Samnites, with the Gauls and Etruscans, and with the Greek colonies, resulting in the supremacy of Rome in Italy; character of Roman rule; military roads and military system.

4 **Punic wars.**— Carthage; origin of the first war; first Roman fleet; defeat of Regulus, defeat of Claudius, naval disasters; Hamilcar; peace with Carthage; second Punic war; Carthaginians in Spain; Hannibal invades Italy; battle of Cannæ; operations in Spain, in Sicily, in Italy; Scipio a consul; results of the war; third Punic war and destruction of Carthage.

5 **Roman conquests.**— Illyrian wars; Macedonian wars; Achæan wars; Spanish wars; the Numantine wars; Roman provinces, how governed.

6 **Gracchi.**— Condition of the state, reforms of Tiberius Gracchus; Caius Gracchus a tribune, his measures of reform.

7 **Jugurtha and his times.**—War with Jugurtha; Metellus, Marius and Sylla; triumph of Marius.

8 **Cimbri and Teutones.**— War with the Cimbri and Teutones.

9 **Civil wars.**— Consulship of Sylla; civil war between Marius and Sylla; Marius exiled, Sylla dictator.

10 **Wars with Mithridates.**— Pompey commander, his operations in the east; history of Catiline; Cicero a consul; Pompey's triumph; rise of Cæsar.

11 **Conquest of Gaul.**— Campaigns against the Helvetians, the Nervii, the Veneti; invasion of Germany; invasion of Britain; the Gauls submit and are organized as a Roman province.

12 **From the first triumvirate to the battle of Actium.**— The Triumvirs,—Pompey, Crassus, Cæsar; Cæsar menaced by the senate, crosses the Rubicon; civil war; death of Pompey; assassination of Cæsar; Octavius and Antony; battle of Philippi; battle of Actium.

13 **Twelve Cæsars.**— Julius; Octavius [Augustus], emperor, policy at home; military operations, Tiberius; Caligula; Claudius, Britain invaded; Nero, fire in Rome, persecution of Christians; Galba; Otho; Vitellius; Vespasian, Colosseum, capture of Jerusalem; Titus, Pompeii and Herculaneum destroyed; Domitian, campaign in Britain.

14 **Succeeding emperors.**— Nerva; Trajan, conquests in the east; Hadrian, his travels, his buildings; Antoninus Pius; Marcus Aurelius; Commodus and others; Diocletian and Maximian, division of the Roman Empire into two empires; the conversion of Constantine and the spread of Christianity.

15 **General topics.**— Roman life; the city of Rome; a Roman house, lighting, warming; meals; clothing; trades; education; amusements; marriage; funerals.

Great statesmen and orators.

Great commanders.

Great writers and their works.

English history.— The close relation between English and American history makes this subject of great importance. The student should be taught to seek the germs of American institutions in the unfolding events of English history. It will not be sufficient to note the succession of kings and the wars and revolutions of the country. It is more important to study the progress of the people in intelligence, in material comforts, and in the arts of civilization. The attention of the candidate should be directed to the following topics:

1 **Geography and early inhabitants of England.**— Geographic description of England; influence of its physical features on its political and commercial prosperity; location of harbors, great cities, manufacturing centres and points of historic importance.

The first known inhabitants of England, their characteristics, mode of life, government, religion.

2 **Roman period.**— The Romans in England, and the traces left by them in the soil, in the language and in names.

3 **Saxon period.**— The Saxon invasion and the Saxon heptarchy; the early Saxon kings; the reforms of Alfred; the Danish invasion and rule.

4 **Norman kings.**— The Norman invasion and conquest; influence of the Norman laws, customs and language.

5 **Plantagenet kings.**— The constitutions of Clarendon; Thomas à Becket; conquest of Ireland; struggles of English barons with their kings for baronial and popular rights; the concession of the great charter of liberty and other concessions; the origin of parliament; wars with Scotland and France; the conquest of Wales; Wycliffe and the first reformation.

Culture, manner of life and condition of the people under the Plantagenet kings.

House of Lancaster.— The wars with Scotland and with France; Agincourt; Joan of Arc; Jack Cade's rebellion; wars of the Roses.

House of York.— The art of printing; William Caxton: Bosworth; culture, manner of life and condition of the people under the Lancastrian and Yorkist kings.

6 **Tudor period.**— Perkin Warbeck's insurrection; discoveries in the new world; wars with France and Scotland; the reformation; overthrow of the papal power in England and suppression of the monasteries; the bloody statute; Mary and the restoration of the papal power; loss of Calais; Elizabeth, and Mary Queen of Scots; the puritans; restoration of protestantism; the Spanish Armada; condition of the people during the Tudor period; courts of Star Chamber and High Commission.

7 **Stuart period.**— Gunpowder plot; the puritans; James I and house of commons; absolute government of Charles I; ship-money; the covenanters in Scotland; the long parliament; Cavaliers and roundheads; the civil war; Oliver Cromwell and the protectorate; the Irish rebellion; the restoration; Charles II and Scotland; the popish plot; the revolution of 1688; bill of rights; war of the Spanish succession; union of England and Scotland; condition of the people during the Stuart period.

8 **House of Hanover.**— Accession of George I; the South Sea bubble; Sir Robert Walpole; war with Spain; war of the Austrian succession; seven years' war; Clive and the conquest of Bengal; the war of American independence; William Pitt and Edmund Burke; the French revolution; affairs in India; Warren Hastings; the Irish rebellion and the union of England and Ireland; the peninsular war; second war with America; the battle of Waterloo; Catholic emancipation; parliamentary reform; abolition of slavery; accession of Queen Victoria; the Chartists; repeal of the corn-laws; wars in Asia and Africa; the Crimean war; the Indian mutiny; the eastern question; the Berlin treaty and the part of England in it; Egypt and the Suez canal; the planting of English colonies in Australia and Africa; general legislation under Victoria; culture, manner of life and condition of the people under the house of Hanover.

9 **General topics.**— The English sovereign; powers, ministry, succession.

English parliament; its powers; mode of election of members; mode of dissolution; how laws are passed.

English navy and army.

Manufacturing interests of England.

Great cities of Great Britain.

Rise of railways and steamship lines.

Land tenure in England, Scotland and Ireland.

Great statesmen and orators.

Great commanders.

Great scientists, inventors and discoverers.

United States history.— As the future of America depends entirely on the loyalty and intelligence of her citizens, a knowledge on their part of the nature, origin and growth of American institutions is of the utmost importance. "Men will always fight for their government according to their sense of its value. To value it aright, they must understand it. This they can not do, without education."

Students of American history should seek the germs of our free institutions in English history. They should follow the growth of these germs through the events of the colonial and revolutionary periods, and through the nineteenth century, with its marvelous developments, up to the present day. A familiar acquaintance with the annals of the past is necessary to all who would fit themselves properly for the privileges and responsibilities of the future.

The examinations in United States history presuppose that instruction has been given in the form of familiar talks in the primary grades, and, in connection with exercises in reading, memorizing and reproduction, has been pursued in this manner through the intermediate up to the grammar grades, where the work has been systematic and connected. Special attention should be given to the history of New York state.

The skilful teacher will succeed in adding life and interest to the bare outline indicated below, thus preparing his classes properly for the study of civics and economics.

1 **Geography of North America.**— Mountain and river systems; harbors and navigable waters; influence of its topography on the settlement and development of the country; location of great cities and places of historic interest.

2 **Colonial period.**— The natives who occupied the present territory of the United States; their character and mode of life; their forms of government.

The early discoverers of America: Columbus; John and Sebastian Cabot; Vespucci; Frobisher; Drake; Gilbert; Grenville; Ponce de Leon; De Soto; Verazzani; Cartier; Champlain; Marquette; La Salle; Hudson.

The early settlement of Virginia; Raleigh; the London company; the first colony, its trials and misfortunes; Captain John Smith; the colony under King Charles, under the commonwealth, after the restoration.

The Plymouth colony; the first puritan settlers; constitution and system of government; early history.

Massachusetts, its early settlement; government; religious troubles; disputes with the mother country.

Connecticut settled; the Pequod war; the settlements at New Haven, at Providence, at Rhode Island; Maine; New Hampshire.

The formation of the New England confederation in 1643; external dangers; internal disturbances.

New England under the restored Stuarts; royal commissioners; prosperity and liberty; war with King Philip; Massachusetts' charter annulled; policy of James II.

New England after the revolution of 1688; effect of the revolution on the colonies; witchcraft; war with the French in Canada, 1689; war with the Indians; contests in Massachusetts with the governors.

Maryland: Grant of land to Lord Baltimore; first settlement; the constitution; dissensions in the colony.

New York: Settlement of New Netherland; the Dutch governors; relations with the Indians; English conquest; under James II; after the revolution of 1688; prosperity and growth.

The Carolinas: First settlement; plan of government; early history; wars with the Indians; war with the Spaniards; disputes with the proprietors; made royal colonies.

Pennsylvania and New Jersey: Quaker settlements in West Jersey; William Penn; settlement of Pennsylvania; East Jersey under proprietors; East and West Jersey united.

Georgia: Motives for its settlement; first settlers; Governor Oglethorpe; collisions with the Spaniards; war with Spain, 1739; a royal colony.

War with the French: The French in Canada, in Louisiana and in the Ohio valley; Franklin's plan for a union of the colonies; Braddock's defeat; attack on Canada; peace of Paris, 1762; the Cherokee war; the Pontiac war.

Condition of the colonies: Population; slavery; mode of life; education; relations between the colonies; relations to England.

Disputes between England and the colonies: the navigation acts; the stamp act; the tea tax; the Boston port act; the Congress of 1774; English policy.

3 **Resistance of the colonies.**— Sources of strength and weakness; outbreak of the war; congress of 1775; Washington in command; invasion of Canada; declaration of independence, 1776; articles of confederation; Tories in America; operations at New York, in New Jersey; the New York campaign and the surrender of Burgoyne; alliance with France; operations of 1778; Arnold's treason; disaffection of troops; surrender of Cornwallis, 1781; conclusion of peace, 1783.

4 **Federal constitution.**— Articles settled; imperfections; formation of a new constitution; the ordinance of 1787; Washington the first president; organization of the present form of government; state of the country; condition of the people.

Successive administrations; important events under each; purchase of Louisiana; war with Tripoli, 1801; invention of the steamboat; war with Great Britain, 1812; rise of the navy; war with the Creek Indians, 1813; defeat of the

British at New Orleans, 1815; Missouri compromise, 1820; growth of the cotton industry; South Carolina nullification; introduction of railways; the Ashburton treaty; formation of new states; growth of population.

5 **Slavery conflict.**— Origin of slavery; the slave trade; the policy of the south; the annexation of Texas; the Mexican war; the agitation as to the abolition of slavery; the election of a president on the issue; secession of southern states; formation of the Southern Confederacy; outbreak of war; successive campaigns and final defeat of the south; reconstruction of the Union; California a state; the growth of the north-west, and the formation of new states.

6 **General development.**— Effect of immigration; sources of immigration; religious sects; education and school systems; growth of manufacturing interests; growth of agriculture; growth of commerce; canal systems; railways; telegraphs; great statesmen and orators; great writers; great philanthropists; promoters of material interests; inventors.

GROUP 4 CONCLUDED

SOCIAL SCIENCE

Civics **Economics**

Civics.— The object of this study is to give the student an elementary, but yet a reliable and useful knowledge of the principles and forms of the government under which he lives, and of the ordinary laws by which he is governed. It is meant to afford the future citizen a preliminary training in the political duties to which he will be called. With this end it is made to include some account of the national and state governments, and of the laws which regulate the ordinary relations of life. The treatment of the subject may be considered as including four different parts: *first*, the principles of government and a comparison of the different forms of government; *second*, the national government of the United States; *third*, the system of state governments, and specially the government of the state of New York; *fourth*, the laws which relate to the citizen in the ordinary relations of life.

1 **Principles and forms of government.**— The theories as to the origin of government; the rights of man under government; the different forms of government, as illustrated in the past and in the existing nations of the earth; the relative advantages and defects of the several forms of government, and in particular of that of the United States.

2 **National government.**— Origin of the union of the states composing the United States; articles of confederation; the present constitution, its original provisions and its subsequent amendments; the nature of the union and the right of secession; citizenship and naturalization.

Executive branch of the government; qualifications, duties, mode of choice and tenure of office of the President and Vice-President; the organization and administration of the several departments, viz., of State, of the Treasury, of the Interior, of War, of the Navy, of the Post-office, of Justice, and of Agriculture; officers of these departments, their qualifications, duties, tenure of office and mode of appointment; the organization and command of the army and of the navy.

Legislative branch of the government; the Senate and the choice of senators; the House of Representatives and the election of members; meetings and organization of Congress; mode of enacting laws; limitations to the powers of Congress; power of Congress to impose taxes, to regulate commerce, to govern the public territory, to declare war, and other powers.

Judicial branch of the government; the system of United States courts and their jurisdiction; the relation of state and national courts; judges and prosecuting officers, their qualifications, duties, tenure of office and mode of appointment.

3 **State governments.**— State governments, their relation to the general government; formation of new states; origin

of the state government of New York; present constitution of New York, how established; its provisions; citizenship; suffrage; qualified voters; classes excluded from voting; the division of the state into counties, towns, cities and villages, and subordinate districts.

The executive officers of the state, their qualifications, duties, tenure of office and mode of choice, viz., the Governor, Lieutenant-Governor and other state officers; the officers of a county; the officers of a town; the officers of a city and of a village.

The state Legislature, how constituted and elected; manner of enacting laws; the powers of the Legislature, and the limitations thereof; the veto power of the Governor.

Courts of the state of New York; judges and prosecuting officers; attorneys and counselors; the manner of proceeding in civil and in criminal cases; functions of the Court of Appeals.

Taxes, their assessment and collection; expenditures for compensation of officers; for education; for the support of institutions for the unfortunate and criminal classes; for canals, railways, etc.; for the maintenance of military and police organizations.

The school system of New York state; the Regents of the University, the Superintendent of Public Instruction; other school officers.

4 **Laws relating to American citizens.**— Sources of the laws affecting the American citizen; his rights as to liberty, protection and property.

Laws as to persons; distinction between a citizen and an alien; marriage, and the rights and duties of the parties; parents and children; master and servant.

Laws as to property; title and transfer of real estate; appurtenances of real estate; landlord and tenant; mortgages, promissory notes, indorsements and interest.

Wills and the distribution of property after death; gifts and bequests.

Contracts; general obligation of contracts; when not binding; remedy for broken contracts; contract to sell or exchange; contract to let or lease; contract for transportation or insurance; contract between principal and agent, and between employer and employed; contract between partners; contract between members of a joint-stock company; between members of mutual aid associations.

Crimes and their punishment; criminal tribunals; rights of an accused man; procedure in criminal cases.

Economics.— The study of economics should be pursued chiefly with reference to the special questions of American politics. It should be made to contribute material help to the future citizen, in providing him with a sound basis for his opinions and his actions. Ignorance of the principles of economics has led in this country to endless mistakes, both in private enterprises and in public measures. To diffuse information on questions of finance and productive industry, will be one of the most valuable services which the school can render to the community. While there is much in the investigation of these questions which will tax the maturest intellect, there is no reason why the rudiments of economics may not be made plain and profitable to scholars in academies.

The examination on this subject will presuppose that the student has pursued it about twenty weeks, and has had the guidance of a teacher who knew how to give an interest to it by illustrations and exemplifications drawn from the current discussions and events of the time. The principal points for which the candidate will be held responsible are these:

1 **Definitions and fundamental laws.**— Definitions and fundamental laws of the subject; the theory of the right to property; the right to exchange.

Wealth; in what it may and may not consist; sources of wealth; value, and on what it depends.

2 **Production.**— The requisites for the production of wealth.

Labor as an agent of production; kinds of labor; physical labor; mental labor; changes effected by labor.

Labor as affected by the use of tools and machines; natural agents, animate and inanimate, as aids to labor.

Division of labor; advantages; applications to physical and to intellectual labor; restrictions in the division of labor; evil effects resulting from the division of labor.

Capital, its proper definition; forms of capital; consumption of capital; fixed and circulating capital.

Cooperation of labor and capital; may be united in one person or may be separated; reasons for the separation; mutual interests of labor and capital; just distribution of rewards to each; cooperative associations; solution of labor difficulties by arbitration; profit-sharing and cooperation.

3 **Distribution.**— Principles on which the proceeds of industry are divided; remuneration of labor; fluctuation in wages; wages as dependent on the cost of living; value of products; competition; combinations and labor unions; labor as affected by peculiarities of race, diet, habits, intelligence and technical education; prison labor.

Circumstances determining the compensation of persons in the learned professions; of authors and artists; commissions and fees.

The remuneration of women's labor; causes for a difference between the remuneration of men and women; vocations for women.

The remuneration of capital; rent of land; circumstances determining rent; tenure of land; equitable division of profits between proprietor and tenant; rents in cities.

Interest on capital; circumstances affecting the rate of interest; interest in new and in old countries; laws regulating the rate of interest, how far are they reasonable? how far practicable? equitable division of profits between capital and labor.

Taxation; grounds for laying taxes by government; direct and indirect taxation; tariff of duties on imported goods; excise tax; income tax; stamps; licenses; national and state taxation, mode of assessment and collection; local taxation.

Expenditures by the government; for the support of the government establishments; for national defense; for public order and security; for education; for the care of the unfortunate classes.

4 **Exchange.**—Nature of exchange; the value and price of commodities; the causes which regulate prices; market value; price of natural commodities; price of manufactured commodities.

Money; exchange by barter; use of money in exchange; functions of money; materials used as money; qualities of gold and silver which fit them for money; circumstances affecting the value of money; agency of the government in issuing and regulating money; depreciation of silver; double standard.

Nature and forms of credit; the functions of credit; credit as an instrument of exchange; abuses of credit; over-speculation; over-estimate of wealth; enhanced risks of business; personal and national credit.

Banks, their proper functions; banking systems of England and of the United States; the national banks of the United States, their organization, their business and profits; the security of their notes; liabilities of stockholders; security for depositors.

Paper money, its advantages and disadvantages; bank-notes; United States bank-notes; United States greenbacks; redeemable paper money; convertible paper money; inconvertible paper money, its effects on trade.

Trade with foreign nations; reasons for the existence of trade with foreign nations; arguments in favor of free trade; arguments in favor of protection; effect of protection on the prices of articles; effect on the remuneration of labor; effect on the establishment and progress of manufacturing industries; effect in rendering a nation independent of others; evils connected with the maintenance of a protective system.

Advantages and disadvantages of associated capital; advantages and dangers arising from great corporations.

GROUP 5

OTHER STUDIES

Ethics	Psychology	Drawing
Book-keeping		Advanced drawing

Psychology — The study of psychology has always been ranked as one of the highest in a scheme of education. In its full scope it is beyond the powers of the ordinary student. But as there is a profitable mode in which the natural sciences may be studied by young students, so there is a method of study by which a knowledge of the mind and its operations is attainable by the student before he is ready for the profounder problems of the science.

In pursuing this subject the student will be expected to become acquainted with the terms employed, and to acquire a clear notion of the distinctions between them.

He should comprehend that the mind is the subject-matter of psychology just as the material world is the subject-matter of natural science, and that the same method of study is necessary in the one as in the other; viz., observation, comparison, deduction.

It is not proposed in this examination to require the full knowledge of all the phenomena of mind under their several divisions of sensibility, intelligence and will. It is deemed best to confine the examination to the philosophy of the intellect, and to include in it what is covered by the following analysis:

1 **Perceptive processes.**—

Consciousness, its nature and the subjects on which it is exercised; its proper classification in the science.

Attention, nature of the mental process; habits of attention; the necessity of attention in the performance of acts, and the possibility of attending to more than one thing at once.

Perception by the senses,— hearing, seeing, touch, taste and smell; perception of the qualities of material objects; original and acquired sense perception; theories of perception; credibility of our sense perceptions; the development and growth of our sense perceptions.

2 Representative processes.—

Memory, its nature; its dependence on attention; on distinct apprehension; on association; on orderly arrangement; the development of memory in the child; the cultivation of memory; memory as related to intellectual strength; effects of disease on the memory; pleasures and pains of memory.

Imagination, its office; its distinction from memory; its conditions and limitations; uses and abuses of the imagination; culture of the imagination; fields for the exercise of the imagination; theories as to the imagination.

3 Thinking processes.—

Formation of the conceptions on which the activities of the mind are exercised; the process of grouping individual things into classes; the formation of generalized conceptions.

Formation of judgments; the form in which judgments are expressed; classes of judgments.

Deductive reasoning; distinction between judgments and reasoning; probable reasoning, relating to physical phenomena, to sentient beings, to historic events; mathematic reasoning, its materials, definitions and axioms, its methods and the nature and authority of its conclusions; the syllogism, its parts and their relation, its conclusions, its utility.

Inductive reasoning; its true nature and extent; inductions of common life; inductions of science; the nature of an hypothesis, of a theory, of a law; observation and experiment; rules for testing inductions.

4 **Intuitive knowledge.—**

Nature of the knowledge known as intuitive; the theories as to the source of intuitions; the criteria by which first truths are tested.

Intuitions as to being; as to relation, diversity, similarity; as to space, geometric extension, limitations of the sense perceptions of space; as to time; duration—how related to acts of the mind; standards for measuring space and time.

Cause and effect; the nature of a cause; mediate and final causes; the source of our belief in a cause.

Ethics.— The following analysis will indicate the character and scope of the examination in this subject. For students of the age usually found in academies it will be found most profitable to treat more fully the parts of the subject dealing with practical morals, passing more slightly over the theories which have been propounded.

1 **Theory of morals.**— The origin of our notions as to the moral quality of actions; are they the result of judgment or of association? are they intuitive or derived from education?

In what the moral quality of an action consists; is this quality absolute and universal? the relation which motive holds to the moral quality of an action.

2 **Sanctions of morality.**— Conscience, its nature; its functions, if any, in discerning the right and wrong of actions; in predicting the disturbing consequences of violating its dictates; in pronouncing authoritative judgments on actions.

Physical sanctions; the pleasure which follows good actions, and the suffering which follows wicked actions.

Social sanctions; the public conscience and its judgments; the influence of the opinions of our fellow-men; the influence of penal laws; the purpose and end of penal laws.

Religious sanctions as expressed in the precepts of natural religion; as revealed in the word of God; as taught in systems of belief, and in the moral standards of religious societies and teachers.

3 **Moral duties.**— The duty of man to himself; self-love universal; duties relating to the body; temperance; the laws of health; exercise of the body; the sin of suicide; duties relating to the soul; the duty of education; the formation of character.

The duty of man to his family; the importance of the family in the constitution of the state; the mutual duties of husband and wife; the duties of parents to their children; support in infancy; education and moral training; physical and industrial training; the rights of parents over their children; limits of the authority of parents.

The duties of children to their parents; obedience; filial reverence; the care and support of parents in sickness and in old age; the duties of children to one another.

4 **Personal rights and duties.** — The correlation of rights and duties; the basis of rights; the basis of duties; the several classes of rights.

The right to property; origin of the right; property, how acquired; the right originating in discovery, in conquest, in long possession; what may become property; property in human beings; property transferable; the sacredness of contracts as to property; bankrupt laws; the rights of succession to property.

The right to liberty; basis of the right; extent and limitations of the right; liberty to pursue vocations; liberty to change residence; freedom of discussion; freedom of the press; freedom in education and in religious worship; slavery, its nature and effects; necessary restraints of personal liberty.

The right to life; basis of the right; the wrong of murder; the right of self-preservation and self-defense; justifiable homicide; protection of property; carrying weapons; dueling.

The right to reputation; the value of a good name; the wrong of slander; the wrong of imputing bad motives; the wrong of turning good actions into ridicule; our duty to reveal crimes and to promote the ends of justice.

The duty of veracity; the law of veracity; its obligation; keeping promises; what promises are not binding; the nature and binding force of contracts; the nature of the judicial oath; the punishment for false swearing.

The duty of benevolence; its foundation in man's nature; objects of charity; duty to help the unfortunate and the suffering; difficulties in administering charities; advantage of associated charity; benevolence to the wicked; humanity in the administration of charities to the criminal classes.

5 **Rights and duties of man in society.**— Civil government, its basis; the form of government; a legitimate government; a tyranny; the rights of a majority; the rights of a minority; laws established by government; penalties enforced against their infringement; right of government to take away property, liberty or life; the just award of punishment; capital punishment.

The duty of the citizen to the government; the duty to support it by taxes, by personal aid, by the sacrifice of life; the duty of the citizen to perform his civil functions; the duty of the citizen to resist the infringement of his rights; the right of rebellion.

The duty of the state to protect its citizens; to administer just laws; to enforce sanitary regulations; to aid and foster the industrial enterprises of its citizens; to provide public education; to encourage good morals, and to repress vice and immorality.

6 **Religious duties of man.**— The basis of these duties the belief in the existence of God; the proofs of this existence; the relations of man to God; the duties growing out of these relations,— worship, prayer, obedience to His laws; the penalties visited on disobedience; the rewards and happiness consequent on piety; the highest sanctions of morality found in the duty of man toward God.

Book-keeping.—

1 **Commercial computations.**— There are three branches of this subject to which the examination is particularly directed. The *first* is that of commercial computations. The candidate must be able to make at sight the ordinary computations arising in business, such as :

Carrying out and footing up a bill of items :

Computing interest on sums of money, both in United States and in British currency :

Computing interest when partial payments have been made :

Computing discount :

Computing commissions and brokerage :

Solving questions arising out of partnerships and the operations of incorporated companies :

Averaging accounts, etc.

2 **Accounts of business transactions.**— The *second* branch of the subject consists of the method of keeping accounts of business transactions. The candidate must be familiar, both theoretically and practically, with the use of the several books of account which are used in ordinary business. He must be able to enter in proper form in such books the common business transactions, and to make out from such books at any time a statement of the condition of the business and of the gains and losses. Both the single and the double-entry forms of accounts must be studied. The method of ruling books for the several purposes of book-keeping should be understood.

3 **Business forms and correspondence.**— The *third* branch of the examination will have reference to business forms and correspondence. It will be expected that the candidate will be able to write business letters, observing the usages and proprieties which are usual among business men. He should be able to draw up in due form such papers as :

Promissory notes and bills of exchange :

Sight and time drafts and bank checks :

Acknowledgments and receipts :

Powers of attorney:
Contracts for service, etc.:
Agreements for a partnership, etc.:
Invoices, accounts, sales and accounts current:
Balance sheets, statements of losses and gains, etc.

4. **Technical terms.**—The candidate should be able to explain and illustrate any technical terms pertaining to book-keeping or to general business, that are in common use among business men and occur in the ordinary text-books on book-keeping.

GROUP 5 CONCLUDED

FORM-STUDY AND DRAWING

Drawing **Advanced drawing**

Drawing.—An elementary knowledge of form-study and drawing is included among the requirements for the junior academic certificate. The examination will be based on the Four Years' Course and Syllabus No. 1, prepared by the late Dr French and adopted by the Department of Public Instruction. The course of study and syllabus are printed in the appendix [pages 135, 142] as an indication of the manner in which the subject should be pursued to insure success in the examination.

In addition to the work referred to above, the examination will presuppose a knowledge of the first 12 geometric problems contained in the advanced drawing; an elementary study of conventionalized natural forms of grouping; of working-drawings and simple developments of surface or pattern-making; of simple examples of leading styles of historic ornament, such as crosses, trefoil, quatrefoil, etc.

Advanced drawing.—The attention of teachers and candidates is directed to Syllabus No. 2, adopted by the Department of Public Instruction and printed in the appendix [page 153], and to the following summary with the note on historic ornament:

THREE DIVISIONS

Construction, which deals with the facts of form:
Representation, which deals with the appearance of form:
Decoration, which deals with the ornamentation of form.

1 **Construction.**—Drawings giving such information as may be required for the manufacture of objects belong to this department. Geometric or plane views are used in construction. A geometric view is one showing but two dimensions. A complete working-drawing consists of as many geometric views as are required to show all the facts of the form of the object to be manufactured.

The front view of a solid gives its greatest extent in a vertical direction, and its greatest extent from left to right. No allowance is made for one part of the object being nearer to the observer than another part, but all parts, whether far or near, are imagined to be projected to the same vertical plane.

The top view of a solid gives its greatest extent from front to back, and its greatest extent from left to right. In such a view, all parts, whether high or low, are imagined to be dropped directly downward to the same horizontal plane.

The side view of a solid gives its greatest vertical extent and its greatest extent from front to back.

Care should be taken that a dimension given in one view be exactly equal to the same dimension given in another view.

The views must be placed in their proper position in regard to one another; the top view above the front view, the left side view at the left of the front view and the right side view at the right of the front view. In a constructive drawing, after the first view required has been drawn, light parallels should be carried from this view toward the place where the next view is to be made. In more complicated objects, sectional views should be required. A sectional view is the representation of an object which gives two dimensions, and the details of an object as seen when it is cut through horizontally or vertically, showing the construction of the interior.

In all constructive drawings the following conventions are to be observed :

1 If a centre line is used in the sketch it is to be indicated in the finished drawing by a dot-and-dash line.

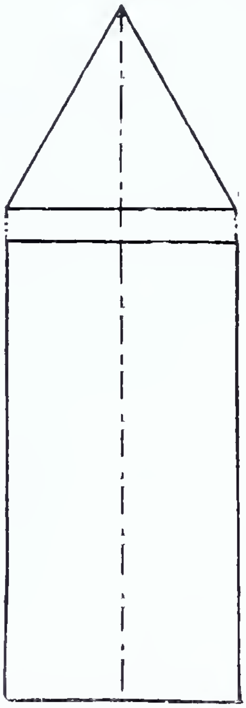
2 Lines connecting points in one view with corresponding points in another view should be finished as dotted lines.

3 Invisible edges or outlines should be indicated by dash lines.

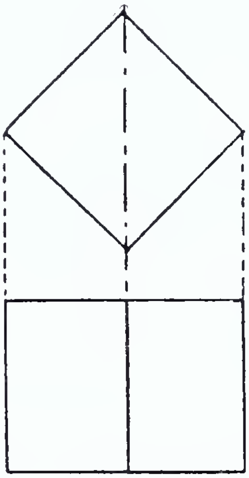
4 Whenever an edge or an outline falls on a centre line, that part of the centre line should be made continuous if the edge or outline is visible ; if invisible, that part should be made a dash line.

5 When a visible edge falls on or coincides with an invisible edge, the latter can not be shown.

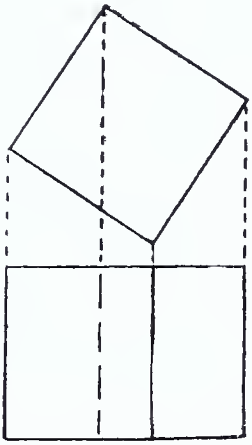
ILLUSTRATIONS OF THE ABOVE POINTS



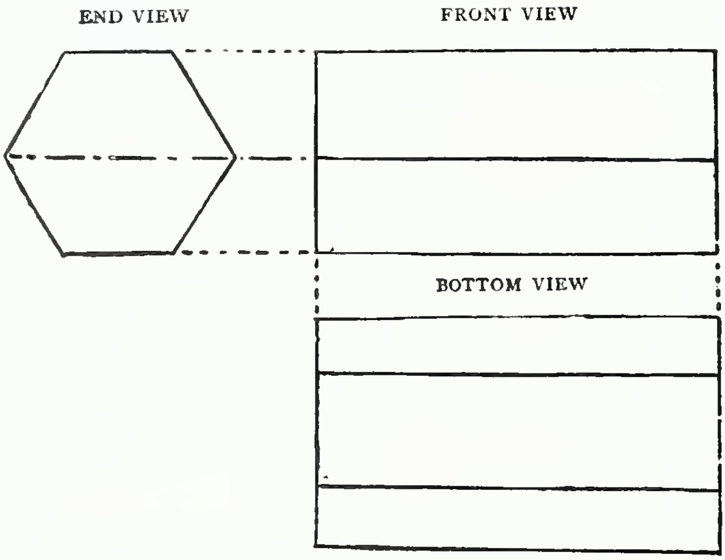
TRIANGULAR PRISM
STANDING ON END



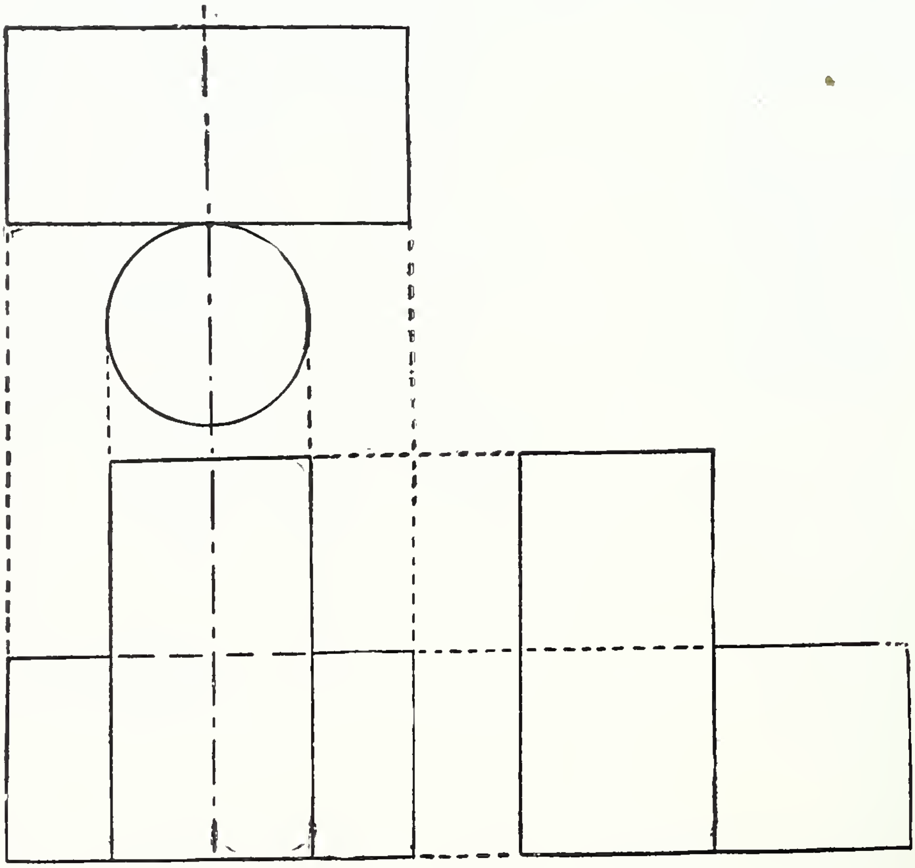
CUBE AT 45°



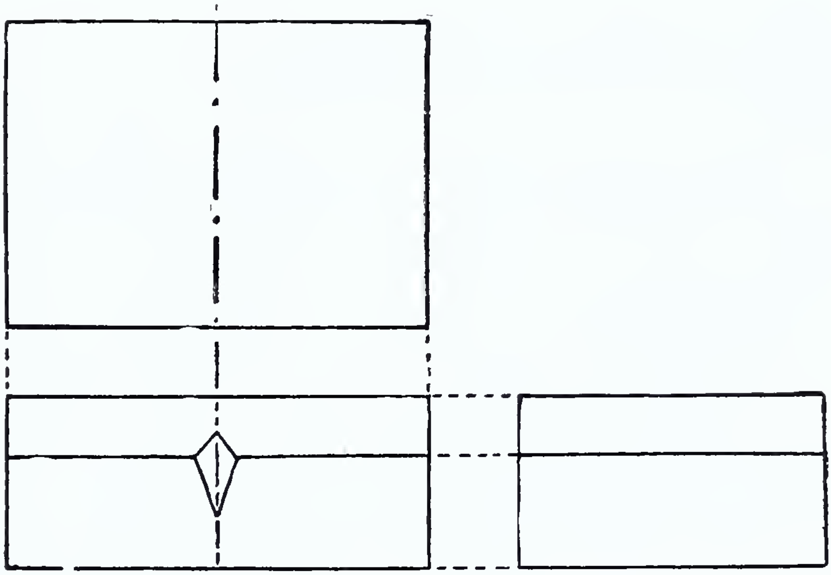
CUBE AT 30° AND 60°



HEXAGONAL PRISM LYING FROM LEFT TO RIGHT



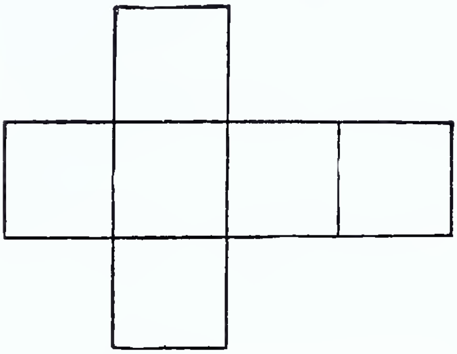
THREE VIEWS OF CYLINDER STANDING IN FRONT OF SQUARE PRISM



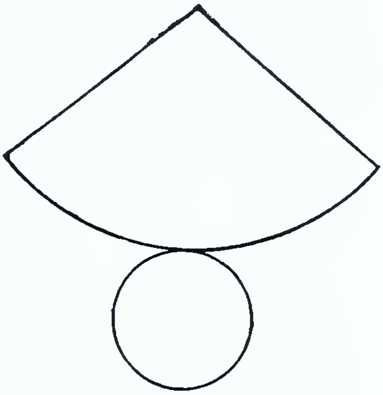
THREE VIEWS OF A BOX

Students should be able to draw patterns of the surface of any of the straight-edged solids, also of the cylinder and cone.

ILLUSTRATIONS OF PATTERNS



CUBE



CONE

The work may be either free-hand or instrumental, according to the requirements stated on the examination paper.

In free-hand work, all lines, both straight and curved, should be drawn with free-arm movement and with but little use of the eraser. This freedom of work produces a quality of line unattainable in any other way.

The instrumental work will include *drawing to scale* and will also cover the following problems:

1 To draw a line parallel to a given line at a given distance from it.

2 To draw a line parallel to a given line, through a given point.

3 To bisect a straight line.

4 To bisect an arc.

5 To draw an equilateral triangle.

6 To trisect a semi-circle.

7 To draw a regular hexagon.

8 To draw a regular hexagon on a given base.

9 From a point outside a given line, to draw a line perpendicular to the given line.

10 From a point at the extremity of a given line, to draw a line perpendicular to the given line.

11 To draw a square on a given base.

12 To draw an oblong, two sides being given.

13 To find the centre of a circle.

14 To draw a circumference through three given points.

15 From a point on a given line, to draw a line perpendicular to the given line.

16 To divide a line into any number of equal parts.

17 To divide a line into parts proportional to the parts of a given line.

18 To bisect an angle.

19 To make an angle equal to a given angle.

20 To make an angle of 45°.

21 To make an angle of 60°.

22 To trisect a right angle.

23 To draw a scalene triangle, the three sides being given.

24 To draw an isosceles triangle, one side and the base being given.

25 To draw a triangle, having angles of 90°, 45°, and 45°.

26 To draw a triangle, having angles of 90°, 30°, and 60°.

27 To find the centre of an equilateral triangle.

28 To draw a square on a given diagonal.

29 Within a given circle, to inscribe an equilateral triangle.

30 About a given circle, to circumscribe an equilateral triangle.

31 To inscribe a circle in a given triangle.

32 To circumscribe a circle about a triangle.

33 To inscribe a square in a circle.

34 To circumscribe a square about a circle.

35 To draw a trefoil.

36 To draw a quatrefoil.

2 **Representation.**— All pictures belong to this department. A picture differs from a plane view in that it shows the *appearance* of *three* dimensions, while a plane view shows the *facts* of *two* dimensions.

Any person may make an accurate representation of the outline of an object by imagining himself looking at the object through a vertical transparent plane and tracing on this plane all parts of the object, whether far or near, just where they appear to come on the plane. This imaginary plane, on which the drawing may be supposed to be made, is called the *picture-plane.* That part of the picture-plane, which is just as high as the eyes of the observer, is called the *level of the eye*, and the point directly opposite the eye is called the *centre of vision.*

Principles in representation:

1 Position affects the apparent form of an object, the sphere being the only exception to this rule.

2 Distance affects the apparent size of an object; therefore, although the whole picture may be made of any size desired, yet the objects farther from the eye must be made smaller in comparison to their actual size than the nearer objects.

3 A plane figure parallel with the picture-plane appears in its true shape.

4 A plane figure at an angle with the picture-plane appears foreshortened, that is, apparently diminished in the dimension extending from the picture-plane.

5 The edge view of any plane face of a solid gives a straight line.

6 An oblique view of a circle gives an ellipse.

7 A horizontal circle not on a level with the eye appears as an ellipse with its length horizontal; and the farther it is placed above or below the level of the eye the more nearly it approaches the circle in appearance: therefore in representing a cylindrical object below the level of the eye, care must be taken that the lower ellipse be broader in comparison to its length than the upper ellipse.

8 Edges parallel with the picture-plane appear in their true relation.

9 Retreating horizontals below the level of the eye, when at the left or right of the observer, appear to slant upward; when directly in front of the observer and perpendicular to the picture-plane, they appear to extend vertically upward.

10 Retreating horizontals above the level of the eye, when at the left or right of the observer, appear to slant downward; when directly in front of the observer and perpendicular to the picture-plane, they appear to extend vertically downward.

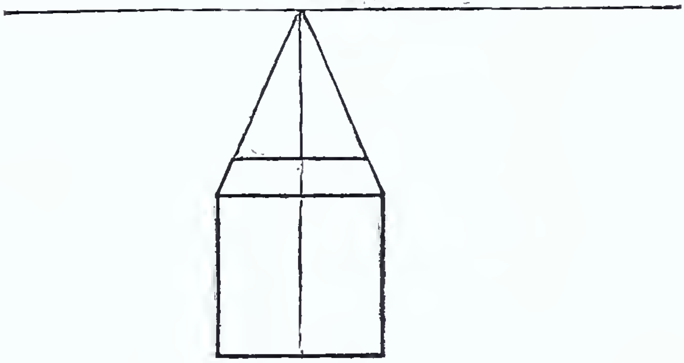
11 Parallel edges extending from the picture-plane appear to converge, and if indefinitely prolonged would finally appear to meet. A point at which parallel retreating edges, if prolonged, appear to meet, is called a *vanishing point.*

12 As many vanishing points may be used in the representation of an object as there are sets of parallel retreating edges.

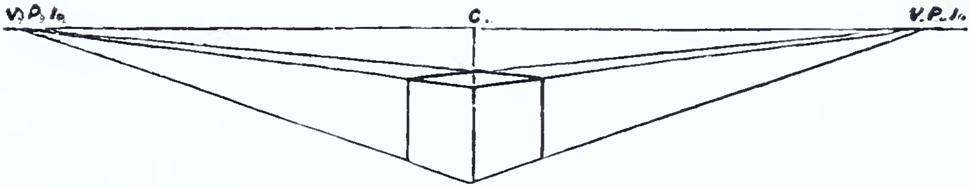
13 Retreating horizontal edges appear to meet their parallels on a level with the eye.

14 Edges perpendicular to the picture-plane, that is, extending directly from the observer, have their vanishing point at the centre of vision.

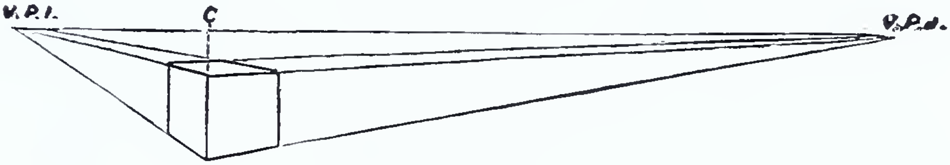
DIAGRAM ILLUSTRATING VANISHING POINTS



ONE VANISHING POINT



TWO VANISHING POINTS



TWO VANISHING POINTS

Note 1—In a finished drawing it is not necessary to show the vanishing point, nor the lines drawn to them; in fact, in a large drawing, these points would fall beyond the limits of the paper and could not be shown. But every student should be able to tell whether his representations of retreating parallels would, if prolonged, meet at the proper vanishing points.

Note 2—As two solids can not occupy the same space at the same time, care should be taken in the drawing of a group of objects standing at the same level, that the bases, if wholly represented, do not interfere.

Note 3—Finish all drawings with rather broad, gray lines. Show the table line, that is, the far edge of the surface on which the objects rest. If invisible edges are required, indicate them by light lines.

Note 4—*All work in representation must be strictly freehand.*

3 **Decoration.**—All designs for ornamentation belong to this department. A decorative design differs from a picture in that its purpose is to give pleasure by beautifying the object to which it is added, while the purpose of a picture is to give pleasure in itself.

1 Fitness to its purpose is the underlying principle of decoration.

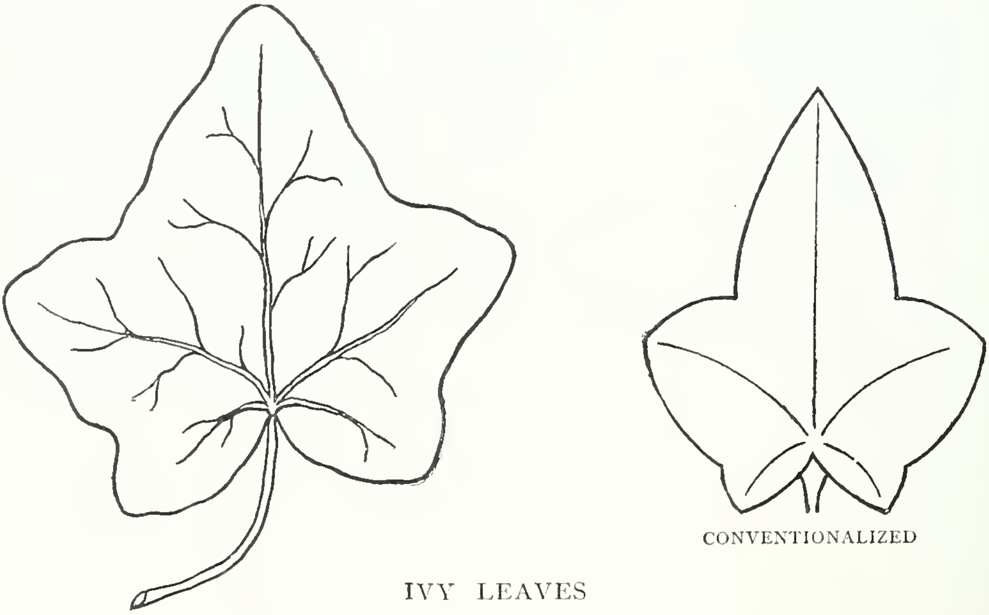
2 That which is used as decoration should not be of more importance than the object decorated and should not detract from the usefulness of that object.

3 A plane surface when properly decorated appears a plane surface. Perspective effects are out of place in plane decoration, belonging strictly to the department of representation.

4 A part repeated to form a design is called a unit of that design.

5 Representations of natural objects are not suitable as units of design.

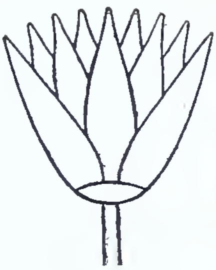
6 Conventional treatments of natural forms may be used as units of design.



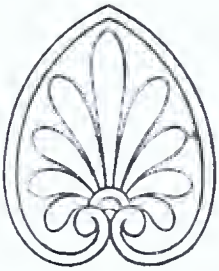
NATURAL

CONVENTIONALIZED

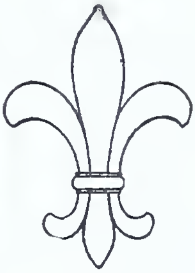
IVY LEAVES



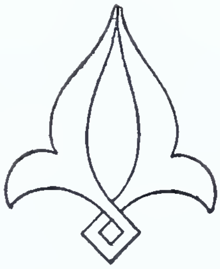
EGYPTIAN LOTUS



GREEK ANTHEMION



FLEUR-DE-LIS

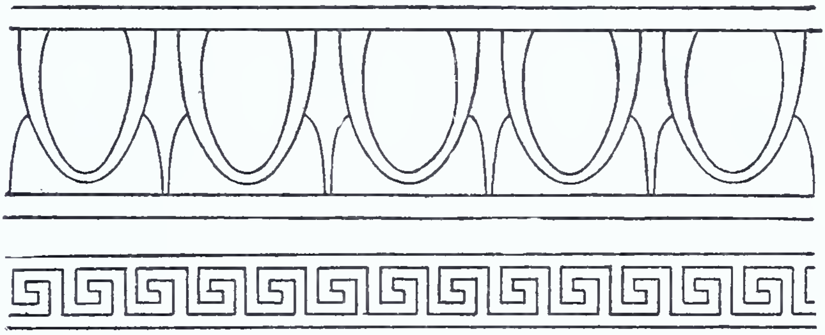


MOORISH ORNAMENT

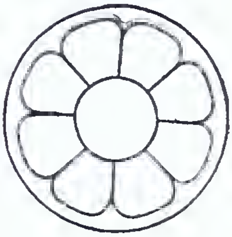
7 Keeping the general characteristics of a natural form, omitting details and accidents of growth, is called conventionalization.

8 A unit of design may be repeated :—

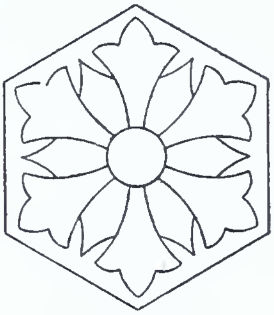
- *a* About a centre, forming a rosette.
- *b* In a line, forming a border.
- *c* To cover a surface, forming an all-over pattern.



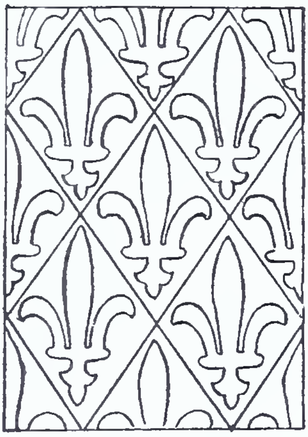
BORDERS



ROSETTE



ROSETTE



ALL-OVER PATTERN

9 The space covered by a repeated unit should be more than that left as a background.

10 In a rosette all units should spring from the centre and should be united at the centre by a strong central figure.

11 In a border, marginal lines should be used to give stability to the arrangement.

12 In an all-over pattern or a border the unit repeated may be a bilateral form or it may be a rosette.

13 A bilateral form is one having an axis of symmetry, that is, one which may be divided into two parts that balance.

NOTE ON HISTORIC ORNAMENT

The student of decoration should become familiar with the leading styles of ornament of nations of the past. To aid in this study, a few thoughts suggested by R. N. Wornum in his "Analysis of Ornament" are given below, followed by an abstract of the work itself.

The leading styles are:

Ancient	Medieval	Modern
Egyptian	Byzantine	Renaissance
Greek	Saracenic	
Roman	Gothic	

Some characteristics of the styles:

Egyptian: Symbolism, simplicity, grandeur, severity, conventionalization of natural forms.

Greek: Æstheticism, artistic finish, simplicity, conventionalization.

Roman: Æstheticism, extreme elaboration, richness.

Byzantine: Christian symbolism, æstheticism, conventionalization.

Saracenic or Moorish: Rigid exclusion of symbolism, geometric symmetry, gorgeous color effects.

Gothic: Christian symbolism, grandeur.

Renaissance, with its developments (*Trecento*, *Cinquecento*, *Louis Quatorze*)*:* Re-birth of classic styles, æstheticism.

These various styles extended over a period of 3,500 years, of which 2,000 may be considered the ancient period, from the early historic times to the third century of our era. About 1,000 years, from the third to the thirteenth century, may be considered the Medieval; and the last five centuries, the modern or Renaissance period.

Style is another name for character. Every style depends on what is peculiar to it, never on what it has in common with other styles. These peculiarities are termed characteristics. The earliest styles are the most simple.

1 Egyptian.— In this style the elements have a particular meaning and are rarely, if ever, chosen for beauty of effect, being mere symmetrical arrangements. The painted ceilings of the tombs of the kings at Thebes form many good examples. Egypt is eminent in the complete adaptation of its own natural productions, and in the conventional treatment of local natural types.

The Egyptian details are not mere crude imitations of nature, but natural objects selected by symbolism and fashioned by symmetry into ornamental decoration.

Here we have the earliest systematic efforts in design.

In many respects the art was as thoroughly understood at Memphis or Thebes 3,000 years ago, as it is at London or Paris this day. Egyptian ornaments admit of no pictures of objects; all are treated conventionally.

Essential symbolic characteristics of Egyptian designs are: the winged globe or beetle, the lotus, the papyrus, the zigzag, the asp, the cartouche, the spiral, the wave-scroll, the fret and sphinx.

The *beetle* occurs in all sizes and in almost all materials, and is a species of talisman or invocation of good luck.

The *globe* is supposed to represent the sun, the wings providence, and the two asps, one on each side of the globe, dominion and monarchy, or the creative, protective and distributive powers, implying order.

We find this ornament placed over doors, windows and in passages, sometimes of an enormous size extending thirty feet or more. It is also frequent in costumes and on mummy cases.

The Egyptian *sphinx* is a remarkable object in art. It is supposed to represent the combination of physical and intellectual power, or the kings as incarnation of such attributes. The chief position of the sphinx was on either side of the path leading to the temple.

The swelling *asps* we find arranged in symmetrical opposition, one on each side of the *cartouche* or shield, enclosing the hieroglyphic name of a king, having the signification of dominion.

The *lotus*, or water lily of the Nile, is the type of the inundations from which Egypt derives its fruitfulness.

The *zigzag* is the type of the water, or of the Nile itself. The ancient signification of the zigzag is still preserved in the zodiac sign of the Water Carrier or Aquarius.

The *wave-scroll* represents water in motion.

The *fret* is a type of the labyrinth of Lake Moeris, with its twelve palaces and three thousand chambers, indicating in their turn the twelve signs of the zodiac, and the three thousand years of transmigration which the wandering soul is condemned to undergo.

The Egyptians systematically varied their pillars in the same colonnade; two alike with their decorations complete were never placed together except as a pair of opposites. The varieties may be reduced to three essential forms, viz.: truncated lotus-bud, lotus-bell, Isis head. Every capital is a variety of one of these essential forms, but the lotus or papyrus-bell of the middle period is much the more common.

The Egyptian style influenced the Jew, the Greek, and the Persian. After Cambyses had plundered Thebes he carried a colony of Egyptian artists with him to Persia.

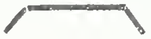
The *bull* which figures largely in the Persepolitan sculpture is explained as signifying the overthrow of the Assyrian power by the Persians.

In Egypt we find grandeur of proportions, simplicity of parts, and splendor or costliness of material — gold, silver, ivory, precious stones, and color — as the great art characteristics.

We also find the prevailing feature of Asiatic art to be *sumptuousness.* Examples: the works of the Tabernacle, the Temple of Solomon, the buildings of Semiramis and Nebuchadnezzar, and the palaces of the Persian kings.

Jewish ornament, like the Egyptian, appears to be purely representative. The only elements mentioned in Scripture are: the almond, the pomegranate and the palm-tree, the lily or lotus, oxen, lions and cherubim.

Extending our view still farther east we find the fantastic the most striking feature of Hindoo art.

The Egyptian was a painted style. Its architecture was marked by the use of the oblique lines  . Length of line, firmness of drawing, severity of form, and subtlety of curvature are its characteristics. Dignity, sternness, simplicity bordering on monotony, extreme solidity, amounting to heaviness, was the expression of the national character of the people.

It is not till we come to Greece that we find the habitual introduction of forms for their own sake, for their æsthetic value purely as ornaments, and this is a very great step in art.

2 Greek.—

Three periods
Doric = Echinus and astragal
Ionic = Doric and horns or volutes
Corinthian = Acanthus

Greek ornament owes its originality to the substitution of the æsthetic for the symbolic principle.

The Doric age covers the first four centuries, from Rhœcus of Samos to Pericles.

The most important manufacture of the period of which remains exist was that of the terra-cotta vases.

There are two classes of painted Greek pottery, the black and the yellow; that is, those vases which have black figures and ornaments, the ground of the vase being left the color of the clay; and those vases which have the ground painted black, and the figures left the color of the clay.

The anthemion, or flower-ornament, is more than the mere honeysuckle; it is this flower alternated with the lily or analogous forms.

Occasionally in the Doric period emblematic ornaments were used with regard to the mysteries, sacrifices, funeral rites, etc., but these instances are rare.

The rainless seasons of Egypt developed massive flat roofs; so the rainy seasons of Greece rendered the sloping roof necessary, the gable of which the Greeks eventually developed into their beautiful pediment.

The Doric order may be descriptively termed the echinus order, as the echinus is the ornament of the period.

Foliage performs a very secondary part in this period.

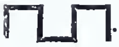
The *Doric capital* consists of a round flat cushion called the echinus, and a large square abacus.

The *Ionic capital* supplanted the Doric, but added to it horns and volutes.

The *acanthus capital* is called Corinthian because discovered by Callimachus of Corinth, 400 B. C.

There is great simplicity in the Greek ornamentation. It generally consists of the various elements arranged in simple horizontal series one above another.

The Greek style was both painted and sculptured, and is distinguished by its broad, flat surface, the use of the ellipse and of the right lines—

.

The ornaments were mostly applied to architecture, and were the zigzag, wave-scroll, fret, cable-moldings, astragals, ogees, channelings, egg-moldings, bucranes, guilloche.

3 **Roman.**—The acanthus order was very little used by the Greeks, while with the Romans it was a favorite.

The Roman style did not add a single element to the Greek, but elaborated the established elements with every possible variety of effect, and with all the exuberance and richness of which it was capable, developing some of them into colossal proportions. It is original only in its treatment of Greek materials. Its chief peculiarity is its uniform magnificence.

The only distinct Roman order is the *composite*, which implies the three Greek orders; the echinus, the volute and the acanthus.

The *shell* and the *arch* may be considered new elements in ornament.

The Roman characteristics are the elements most rarely used among the Greeks.

The acanthus and the scroll, in every form except the capitals, are peculiarly Roman.

Roman buildings are more massive than Greek, as well as bolder in their details. Their curves are much fuller, the Romans using the circular where the Greeks use the elliptical.

The free introduction of monsters and animals is likewise characteristic of Greek and Roman ornament, particularly of the latter.

The traits of the three ancient styles — Egyptian, Greek and Roman — are very distinct.

The Egyptian is symbolic, rich and severe.

The Greek is severe and beautiful.

The Roman is rich and beautiful.

The Roman was a sculptured style, distinguished by the use of the circle. Circular arches mark the architecture. The decorations show continuous growth.

Roman ornament may be regarded as an exaggeration of the florid Greek.

4 **Medieval Christian art.**— The peculiar views of the early Christians did not influence art until the establishment of Christianity by the state. Constantine was among the first champions. During the first and second centuries, Christian works of art were limited to symbols, and were never applied as decorations but as exhortations to faith and piety. All Christian decoration rests on this foundation — the spirit of symbolism prevailing throughout, until the return to the heathen principle of beauty (the æsthetic) in the period of the Renaissance.

Early symbols

- Monogram of Christ
- Lily
- Cross
- Serpent
- Fish
- Aureole (*vesica piscis*)
- Circle (*nimbus*)
- Hand

The *circle* or nimbus represented the glory of the head and forms the element of the trefoil and quatrefoil, so common in Byzantine and Gothic art — the first having reference to the Trinity, the second to the four Evangelists as the testimony of Christ, and to the cross, at the extremities of which we often find four circles, besides the circle in the centre which represents the Lord.

Thus, figures or combinations of three. four or five circles are common in medieval art, and have sacred significations. Many crosses are composed entirely of five circles as principals, or are prominently decorated with them.

In crosses composed simply of five circles, the centre circle has reference to our Lord, and the other four to the Evangelists. Occasionally the symbolic images of the Evangelists,— the angel, the lion, the ox and the eagle, —are represented within these circles.

The *lily*, or *fleur-de-lis* is the emblem of the Virgin and of purity. It is as common in Christian decoration as the lotus in that of Egypt.

The *serpent* figures largely in Byzantine art, as the instrument of the Fall and as a type of the Redemption.

The *cross* planted on the serpent is found sculptured on Mount Athos. The cross surrounded by the so-called runic knot is only a Scandinavian version of the original Byzantine image — the crushed snake curling around the stem of the avenging cross. The cross with two scrolls at the foot of it, typifying the snake, is another form of the same.

The *hand* is also a characteristic element of early Christian art.

There is a distinction between the Greek and the Latin form. The Greek symbolizes Jesus Christ, expressing His monogram by placing the thumb on the third finger and slightly curving the second and fourth. The Latin displays the thumb, the first and second fingers extended. The Roman prelate blesses in the name of the Trinity; the Greek, in the name of Jesus Christ.

The dome has its reference to the vault of heaven and the glorification of Christ.

The terms Byzantine and Romanesque are almost synonymous. The wider signification of the Romanesque is found in the earlier Christian round arch in contradistinction to the Gothic or later pointed arch varieties of the North.

If any style can be distinguished by the exclusive title of Christian art, it is the Byzantine.

5 **Medieval Saracenic.**— The Arabs had no art or artists of their own; they came from their deserts with no more taste or knowledge of such matters than a mere love of finery could give them. They could not but be struck by the gorgeous display of cities like Damascus, which fell into their hands in 634 A. D. The Byzantine artists were pressed into the service of the Arabian caliphs, and were ordered to raise rich mosques and palaces. The results were seen in Damascus, Cairo and Cordova.

The conditions of the new Mohammedan law were stringent; in endless designs in mosaic, marquetry, stucco, there was to be no image of a living thing, vegetable or animal.

This led to a very distinctive style of decoration: vegetable forms were now excluded for the first time; ordinary forms from the classic periods, with geometric symmetry, formed the most abundant material. Mere curves, angles, or interlacings constituted the chief burden of a design distinguished only by a variety of color. Although flowers were not directly admitted, the great mass of minor detail was composed of flower-forms disguised, *e.g.*, the Alhambra. Still no actual flower ever occurs, as the exclusion of all natural images is the foundation of the style in its purity. The omission of the *crescent* in Saracenic or Mohammedan work generally, is worthy of notice. It is not to be found in any early work. As it now appears in the mosques of Constantinople, it seems to be simply the trophy of the conquest of the Greek capital, the ancient Byzantium, of which it was the symbol. Constantinople was not captured until 1453 A. D.

CHARACTERISTICS	Ogee Crescent Scalloped arches Pointed arch Round Romanesque arch

The Saracenic was the period of gorgeous diapers. The custom of decorating the entire surface of apartments was most favorable to the development of this class of design.

The Alhambra displays endless specimens, all in relief and enriched with gold and color, chiefly blue and red. The Genoa damask, the Arras tapestries, and modern paper hangings are all imitations of these Saracenic wall diapers. The very word *damask* means Damascus work. Damascus is still famous for its textile fabrics in pure Saracenic taste, and it produces a great variety of patterns in silk and in cotton, the designs of which are chiefly stripes and inscriptions, good wishes and pious sentences. (This style has of late found its way into railway carriages, in which the initials of the company are worked as an ornament, right, left and upside down.) In the Alhambra all the Arabian features are preserved except the scroll and anthemion.

The Saracenic is distinguished for its geometric tracery, strapwork, inscriptions, and wonderful coloring.

It has been said by a competent judge that " Every principle which we can derive from the study of the ornamental art of other nations is not only present here, but was more universally and truly obeyed by the Moors than by any other people."

It has also been said that there are really but three pure styles, all others being derived from them, viz.: Egyptian, Greek, Saracenic.

6 Gothic.—This style grew out of the Byzantine and flourished chiefly on the Rhine, in the north of France and in England. Salisbury Cathedral, A. D. 1221, and the Cologne Cathedral, A. D. 1322, are characteristic specimens. It became quite extinct in England in the sixteenth century. This catastrophe was a result of the reformation.

England has the seven varieties of Gothic architecture :

1 Saxon or simple round arch, Romanesque
2 Round Norman (zigzag)
3 Sharp Norman (Henry II)
4 Early English Gothic (Henry III)
5 Decorated Gothic (the Edwards)
6 Perpendicular Gothic (Henry VII)
7 Debased perpendicular (Henry VIII)

There is no style on which people are more deluded than this of Gothic architecture; its religious elements are Byzantine.

As regards Christianity of style, the most Christian architecture is that of the Mohammedan mosques, which owe their forms to the early Christian symbols as developed by the Byzantine Greeks.

The general characteristics of the Gothic are these: It is essentially pointed or vertical and in its detail is geometric — in its window tracings, in its openings, in its clusters of shafts and bases, and in its suits of moldings — but it is geometric in its construction or in its form only, not in its spirit or motive.

Climate has had much to do with the peculiar development of the Gothic. It has flourished only in cold regions subject to much rain and snow. A Gothic church frequently looks like a fortification against the weather, with its high pitched roof, solid buttresses, narrow doors and windows.

The spire is a common feature of the Gothic. The spire and the tower doubtless owed their development as much to use as to ornament. In early times they were landmarks, performing other useful services besides that of indicating the locality of the church or of securing the elevation of its bells.

Ornamentally, the Gothic is the geometric and pointed element elaborated to its utmost. Its only peculiarities are in the combination of detail in its decorations, the conventional and the geometric prevailing at first, and afterward these combined with the elaboration of natural objects.

The Byzantines never did this; the Gothic vesicas, trefoils, quatrefoils cinquefoils and geometric varieties are infinite. Early English Gothic presents the following characteristics. Mullions instead of piers, windows of several lights, flying buttresses, crocketed pinnacles, complicated moldings, clustered columns, round capitals, an extensive application of foliage, with the trefoil leaf. The dog-tooth molding was also another characteristic; in its original form it was a simple vesica cross, but being contracted to fill hollows, it assumed its present form in the early Plantagenet period.

It is the geometric tracery which stamps a design as Gothic. Examples: Tudor-flower, fleur-de-lis, crocket-leaf, trefoil, vine-scroll, etc.

In this style Norman and classic ornament are not admissible; also tropical plants would be inconsistent.

7 **Renaissance.**— This name implies the revival of art or its re-birth. It was the revival of the classic order of architecture, the ancient art of Greece and Rome in the place of the middle age styles. The essence of all middle age art was symbolism, and the transition from symbolism to the unalloyed principles of beauty is the great feature of the revival. Art was wholly separated from religion in the *Renaissance*, but this transition was developed gradually.

In Italy the change first began about the year 1300. This was in some degree owing to the Crusades, but more especially to the Latin conquest of Constantinople in 1204, which displayed many treasures of ancient art to the Venetians. Four ancient bronze horses, a Christian trophy of this Venetian crusade, still adorn the façade of St Mark's. The beginning of the Renaissance period may be known as the *Trecento*, the more finished as the *Cinquecento*, and the latest, the most modern, as the *Louis Quatorze*.

APPENDIX 1

A COURSE OF STUDY FOR FOUR YEARS IN FORM-STUDY AND DRAWING

I INTRODUCTION

The term *drawing* very inadequately expresses the nature of the study it is desirable to have taught in the schools under the name. When the study was first introduced into the schools, it was very properly called *drawing*, inasmuch as the work of pupils consisted principally of drawing from printed copies, and the instruction was devoted mainly to the training of the hand and eye in copying. As the study has developed, however, under the influence of educational methods, the character of the instruction and the work of pupils have entirely changed.

The study of *form* as observed in models of type-forms and in objects, has taken the place of the study of printed copies, and the instruction has been broadened so as to include the cultivation of the observing powers by the study of things on the one hand, and the expressive powers, through making, drawing, and language on the other,— drawing, however, beyond the elementary work, being the principal means used in expressing form-knowledge and its applications.

Thus it will be seen that drawing is only a feature in the important study of form, while in the applications of form-knowledge, both in education and in practical life, it becomes the principal means for expressing thought. Hence, the proper title for the study that is now desired in the schools is form-study and drawing, and not drawing alone.

The following course of study has been arranged in accordance with this idea of the subject; and is divided into two parts. The first or elementary part is devoted to gaining a knowledge of the properties of forms from models of type-forms and from objects based on them. In this division it is intended that the aim of the instruction shall be to develop the pupil's powers of observation, and to give training in the means of expressing thought in regard to form, through making, drawing, and language.

In the second division the study of form in objects is still continued, but it is now the aim of the instruction to give expression to this form-knowledge, and to make applications of it mainly through drawing. In this division the course of study prepares broadly for general education and for practical life.

In the near future drawing is to be taught in all the public schools of this state.

A person properly qualified to teach the subject must be familiar with the terms, characters and materials used, with the results to be secured, with the development and training of the mental and physical powers concerned in the work, with the proper synthetic order of arrangement of the parts of the subject, with a logical method of presenting instruction and conducting the work; and must also have the manual skill which can be acquired only by considerable practice in all the details of observation, construction, representation and ornamentation.

The subjects with which all teachers should be theoretically and practically familiar, to enable them to give that kind of instruction of the greatest value to the children of the state, are included in the following:

2 COURSE OF STUDY

TYPE-SOLIDS

First year:

1 Sphere
2 Cube
3 Cylinder
4 Hemisphere
5 Square prism
6 Right-angled triangular prism

Second year:

1 Ellipsoid
2 Ovoid
3 Equilateral triangular prism
4 Cone
5 Pyramid
6 Vase-form

a The first half of the first year the work is to be mainly the study of the six type-forms, with some attempts at representation by stick and tablet-laying. Drawing as a regular exercise is not to be required this half year.

b In the second half of the first year simple exercises in paper-folding and paper-cutting are required. Drawing is to begin in this half year.

Method of study:

1 By sight
2 By touch
3 By arrangement

Order of study:

1 As wholes
2 As to faces
3 As to surface
4 As to edges and corners

Ways of expressing:

1 By language
2 By making
3 By drawing

Plane figures to be taught:

1 Circle
2 Square
3 Oblong
4 Right-angled triangle
5 Equilateral triangle
6 Isosceles triangle

Lines are to be taught

As to **directness**:

1 Straight
2 Curved

As to **position**:

1 Horizontal
2 Vertical
3 Oblique

As to **relation**:

1 Parallel
2 Perpendicular
3 Converging and diverging

THIRD AND FOURTH YEARS:

1 Continued study of the twelve type-solids;
2 Study of natural forms based upon them.
3 Teach reversed curves, symmetry and proportion.
4 Drill in position, pencil-holding, pencil-movements and quality of line.

3 OUTLINE OF WORK

FIRST AND SECOND YEARS

TYPE-SOLIDS

FIRST YEAR:

Sphere, cube, cylinder, hemisphere, square prism, right-angled triangular prism.

SECOND YEAR:

Ellipsoid, ovoid, equilateral triangular prism, cone, square pyramid, vase-form.

Method of study:

1 By sight — by observing appearances of models in different positions.
2 By touch — by grasping, by handling, by moving, by placing models.
3 By pleasing arrangement of models in rows, or by building.

General order of study of a type-solid:

1 As a whole; how it feels, how it moves, how it looks, its name.
2 As to surface; round, rounding, plane, curved.
3 As to edges; straight, curved.
4 As to corners; square, sharp, blunt.

The **surface** is the whole outside of a thing. A **face** is a limited part of a surface.

A **sphere** has one round face; a **cylinder** has one curved and two plane faces. A **cube** has six plane faces. A **hemisphere** has one rounding and one plane face. An **ellipsoid** has one rounding face.

Ways of expressing:

1 By making — clay-modeling, paper-cutting, and pasting.
2 By drawing, with free-arm movement.
3 By language, using the proper terms in complete sentences.

Terms to be learned by the use of the solids:

1 Terms of **location**, to be learned by placing the models at left side, right side, top, bottom, near, far, above, below, middle, front.
2 Terms of **direction**, to be learned by movement in the air and on the surface of the model, the blackboard and the desk; round and round, from left to right, from top to bottom, from corner to corner.
3 Terms of **position**, to be learned by placing the models,— upright, standing, vertical; level, lying, horizontal; standing, leaning, oblique.

PLANE FIGURES

Plane figures are derived from type-forms, and are to be studied from the faces of solids and objects, and from tablets.

FIRST YEAR:

Circle, square, oblong, semicircle, right-angled triangle.

SECOND YEAR:

Ellipse, oval, equilateral triangle, isosceles triangle.

Method of study:

1 By sight — by observing and comparing.
2 By touch — by handling and placing.
3 By use in arrangements to represent objects, and for borders and arrangements around a centre.

Order of study:

1 As to shape and name.
2 As to edges or sides; number, quality, relation.
3 As to corners or angles; number, kind.

Ways of expressing:

1 By folding, cutting, mounting figures, borders, and arrangements around a centre made of colored paper — by stick-laying.
2 By drawing — proper pencil-holding, free movement, broad lines.
3 By language.

Terms to be learned:

1 Directness — straight, curved.
2 Location of faces, edges, corners, figures, angles and lines — as upper, lower, left, right, back, front.
3 Position of faces, edges, and lines — as vertical, horizontal, oblique.
4 Relation of faces, edges, and lines — as parallel, perpendicular, converging, diverging.
5 Angles — right, acute, obtuse.
6 Details of faces — as diameter of a circle; diameter, diagonal of a square; vertex, base, altitude of a triangle.

These terms are to be learned by the use of tablets, sticks, and other materials, with regard to faces, edges, corners, figures, angles, and lines.

Develop from the type-forms the drawing of lines and angles. Teachers should exercise their own taste and judgment in the use made of the drawing of objects as wholes. Teachers may either teach surfaces, angles, and lines from the use of tablets, sticks and other objects, by requiring pupils to find and draw the objects in connection with the terms; or they may teach the surfaces, angles and lines in connection with the type-forms

Edges apply to objects; lines, in drawing, are pictures of edges.

Borders should have marginal lines; arrangements around a centre should have a central figure to hold the parts together.

It is not well to combine two colors in making an arrangement of figures from colored paper; two shades of one color may be used.

THIRD AND FOURTH YEARS

Review type-solids; study objects based upon them. The three kinds of work suggested below, should be carried on at the same time.

1 STUDY AND DRAW SOLIDS AS THEY ARE:

1 Geometric views; names of the different views, placing the different views.
2 Patterns or developments of surface.
3 Making type-forms from patterns.

Terms to be learned:

Top view,
Left side or end view, Front view, Right side or end view,
Bottom view.

The proper placing of these views is shown by the arrangement above.

2 STUDY AND DRAW OBJECTS AND NATURAL FORMS AS THEY APPEAR:

1 Opposite the eye 2 Below the eye

Terms to be learned:

Proportion, Outline, Reversed curves.

No attempt should be made at this stage to introduce theoretic perspective. Study the simple appearance of objects opposite the eye, and of natural forms, fruit, etc., below the eye.

3 STUDY ORNAMENTAL ARRANGEMENT:

Seek for beauty. Beauty is the harmony of differences. Study and draw from nature and from ornament:

1 Simple leaves
2 Simple ornamental figures
3 Original arrangement

Steps in arrangement:

1 Arrange tablets and sticks for single figures, borders, rosettes, etc.
2 Cut, arrange, and mount units of colored papers.
3 Draw the arrangements made.

Principles of arrangement:

1 Symmetry secured by balance
2 Proportion learned from the study of pleasing forms
3 Rhythm secured by repetition

Terms to be learned:

Bisect, trisect, axis, trefoil, quatrefoil, border, rosette.

4 SOME IMPORTANT FACTS AND DEFINITIONS

1 Drawing is the graphic expression of form.
2 Industrial drawing is drawing applied to the industries of life. It is both free-hand and instrumental.
3 The basis of industrial drawing is geometric form.
4 Balanced curves are pairs of curves that bend equally — but in opposite directions — in every part.

5 A working-drawing is a drawing that gives all the facts of the form, size, and structure of an object. It is a drawing by which a workman can manufacture an object.

6 A geometric view shows two dimensions only.

7 An elevation is a drawing that shows a vertical side of an object.

5 GENERAL SUGGESTIONS

1 As to materials:

Good and cheap paper, scissors, rulers or straight-edges, pencils, erasers.

Pencils —

Grasping; movements in free-hand and mechanical work.

Erasing —

Pupils make no erasures the first year without the direction of the teacher.

Every pupil should be provided with a set of type-forms for the year in which he is working.

2 As to length and frequency of exercises:

Daily, of about the same length as other class exercises. No attention to other work when this is going on.

3 Length of time required for the course:

With the same proportionate amount of attention that is given to other subjects of equal importance, this course can be completed in four years; but with the attention that most pupils would be glad to give it, five years can be profitably devoted to it.

4 How to introduce the subject into the schools:

a An exercise of fifteen minutes in the study of a type-form will arouse interest in the pupils.

b A sheet of good, light manila paper, 36x54 inches, cut into oblong pieces of about 4x6 inches will supply a class of 40 pupils with all the paper they will need for two weeks. Give these to the pupils and set them to work, more for amusement than as a requirement. Allow no scribbling, crumpling, or waste of paper in any way. Require the pupils to return to the teachers all pieces of paper unused at the close of every exercise, whether they be large or small.

SYLLABUS No. 1

Form-study and Drawing

FORM-STUDY

Form-knowledge is best derived from a study of solid models of type-forms and of objects of similar forms. Form-study, by handling and by seeing, is for the cultivation of the observing powers and for the development of form-ideas in the mind, to be expressed by making, drawing, and language. The method is illustrated by the study of the sphere, cube, cylinder, square and right triangular prisms. These solids are studied as wholes, and also as to their details.

AS WHOLES.—Their resemblances and differences.

Sphere and cube.—In each of these two models the three dimensions the same, (height, width from left to right, width from front to back). The sphere is round; the cube has corners and edges.

Cylinder and square prism.—In each of these models but two dimensions the same, (width from left to right, width from front to back). The third dimension may vary. The cylinder is round one way and has curved edges, while the prism has corners and straight edges.

Right triangular prism.—No two dimensions the same.

No position of the sphere or cube can be designated as horizontal or vertical, as their three dimensions are the same.

The cylinder and prisms may be placed in a horizontal or a vertical position, as two of their three dimensions differ; therefore, there is a greater variety in the different appearances of these models than in those of the sphere and cube.

AS TO SURFACES.—The outside of an object. Surface of sphere is round; of cylinder is curved and plane; of the cube and prisms is plane.

AS TO FACES.— Face, a part of a surface unbroken by an edge.

Character of faces.—Round, as on the sphere; curved and plane, as on the cylinder; plane, as on the cube and prism.

Shape of faces.—Circular, as on the sphere; square, as on the cube and square prism; oblong, as on the cylinder and prisms; triangular, as on the right triangular prism.

Position of faces.—Vertical; horizontal; oblique.

Relation of faces.—Parallel; perpendicular; oblique to each other.

AS TO EDGES AND PROFILES.—An edge is formed by the meeting of two faces. A profile is the limit of the visible part of a round or curved face.

Edges are both curved (on cylinder) and straight (on cube and prisms).

Profiles are both curved (on sphere) and straight (on cylinder).

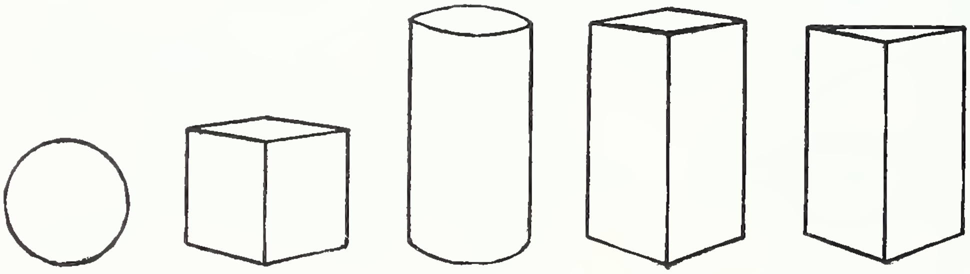
Position of edges.—Vertical; horizontal; oblique.

Relation of edges.—Parallel; perpendicular; oblique to each other.

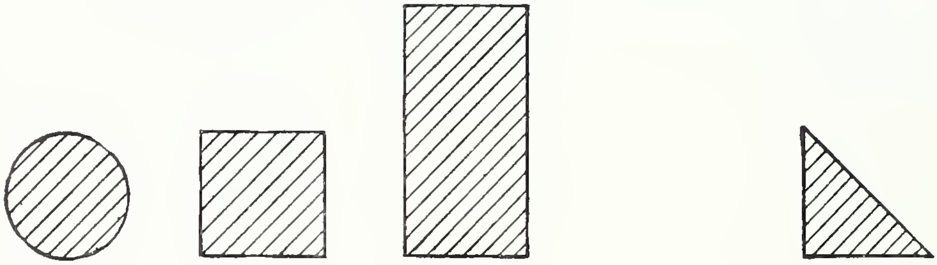
Edges and profiles limit and give the shapes of faces and parts of faces visible.

AS TO CORNERS OR ANGLES.—Corners or angles are formed by the meeting of two or more edges. Observe right angles on cube and prisms, acute angles on triangular prism, obtuse angles obtained by placing square and triangular prisms together.

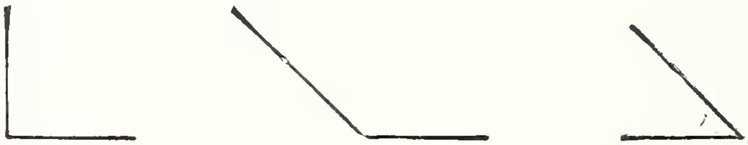
The study of faces, edges and corners should be by observation in regard to their position, location, direction and relation.



MODELS STUDIED

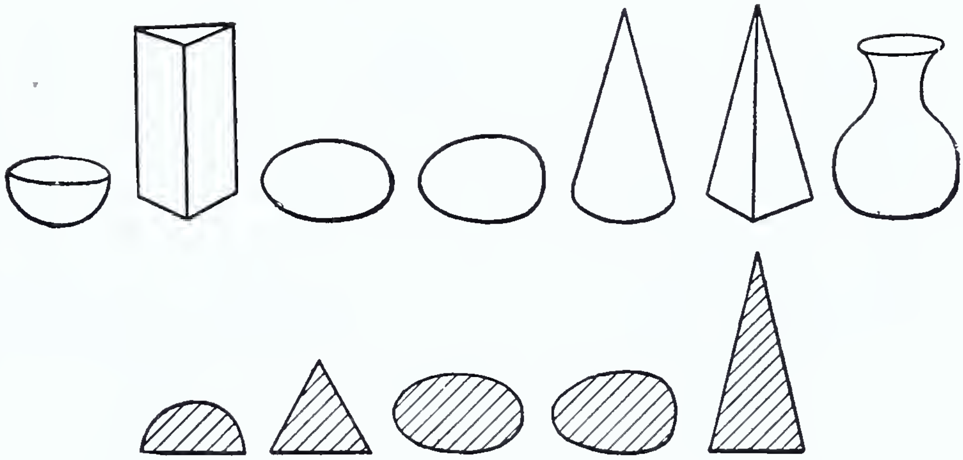


FACES OBSERVED



ANGLES OBSERVED

As the work develops, the models to be studied, in addition to the above, are the hemisphere, equilateral triangular prism, ellipsoid, ovoid, cone, square pyramid, vase-form, together with the geometric faces or figures derived from them, as shown in the following illustrations:



It is not expected that in the upper classes, form-study with all the details here indicated should be presented. It is important, however, that in all classes the work should begin with the study of the solid model or object, and the nature and extent of the form-study should depend on the extent to which the observing powers of the pupils have been developed.

The study of objects like these type-forms should be a feature in the whole work.

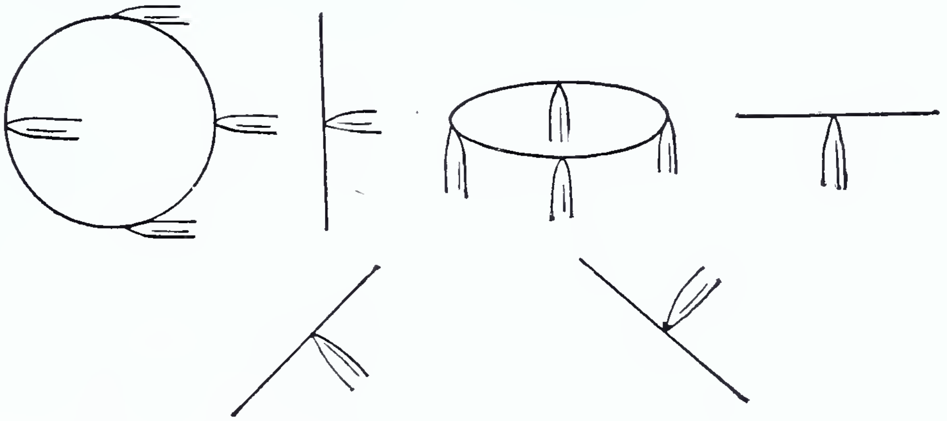
DRAWING

Skill in drawing should be developed as an accurate and ready means of expressing form-ideas. There should be drill in pencil-holding and in the free drawing of circles, ellipses, curved and straight lines.

This drill should be given in connection with the drawing of the form-ideas derived from the study of the models and objects.

PENCIL-HOLDING.—The pencil should be held lightly about four inches from the point, at an angle of about 30° to the paper.

In drawing a circle or a vertical line, the pencil should point to the left. In drawing a horizontal ellipse or a horizontal line, the pencil should point toward the top of the paper.



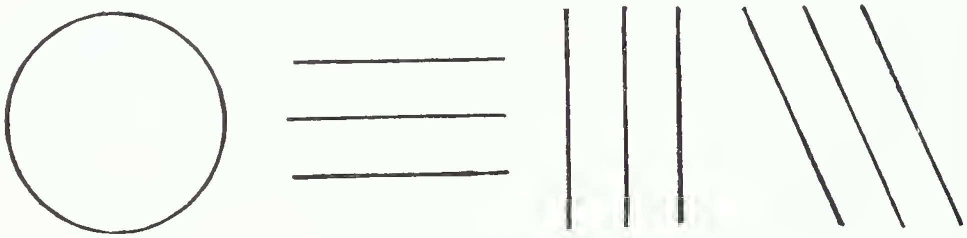
The general rule in drawing straight lines is, that the pencil should point in a direction at right angles to that of the line to be drawn.

DRAWING.—Free work should be obtained in drawing by the movement of the whole arm from the shoulder.

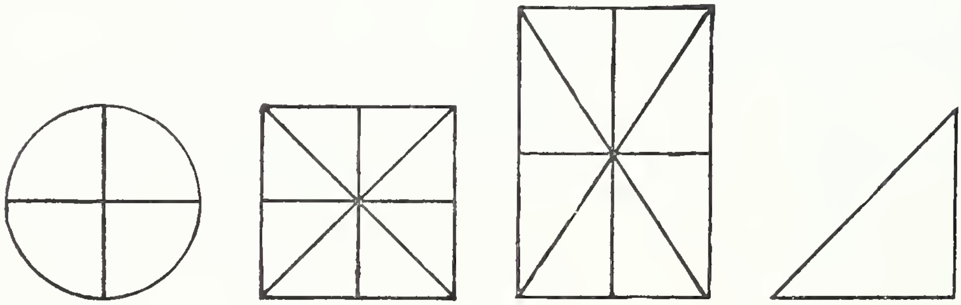
Draw circles and ellipses with a continuous movement, beginning at the lowest point and moving up to the left and around to the starting point.

Much practice should be given in drawing long, straight lines,—vertical, horizontal, and oblique.

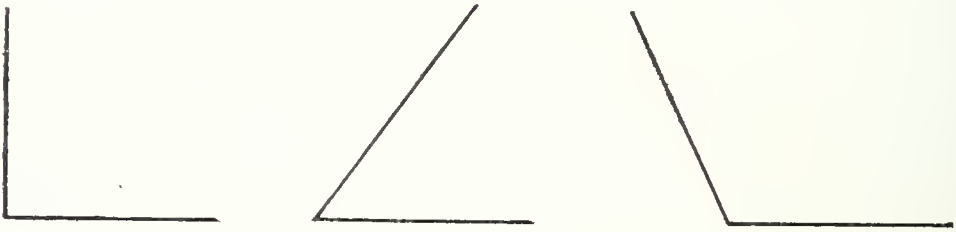
CHARACTER OF LINE.—The line should be a light gray line. Avoid heavy, black lines. Pencils should be of medium grade, and the lead should have a round point, not a sharp point.

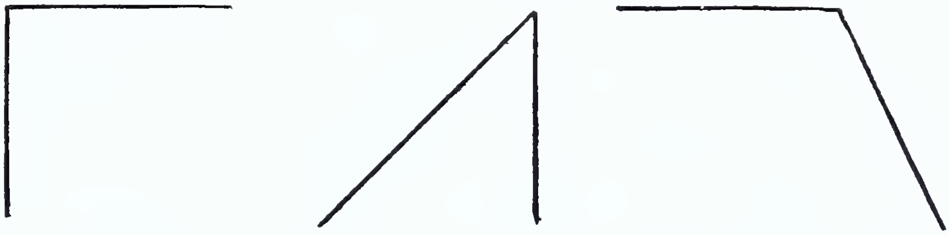


From the faces of the solids studied, we get the circle, square, oblong, and right-angled triangle. Draw these figures. Draw diameters of circle, square, oblong. Draw diagonals of square and oblong. The figures should be from three to four inches high.

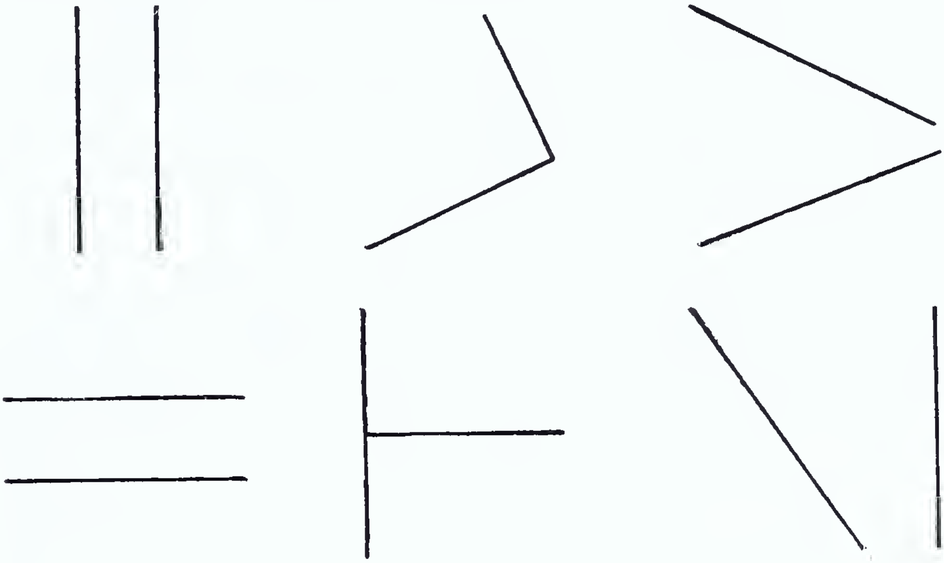


Draw angles, right, acute, obtuse — each angle in two different positions.





Draw lines in relation to each other, as parallel, perpendicular, oblique to each other. (Two examples of each.)



Teachers will find the laying of tablets and sticks to represent the faces of solids and objects, an important aid in teaching these details of form to little children, and of great value in fixing ideas of form for drawing.

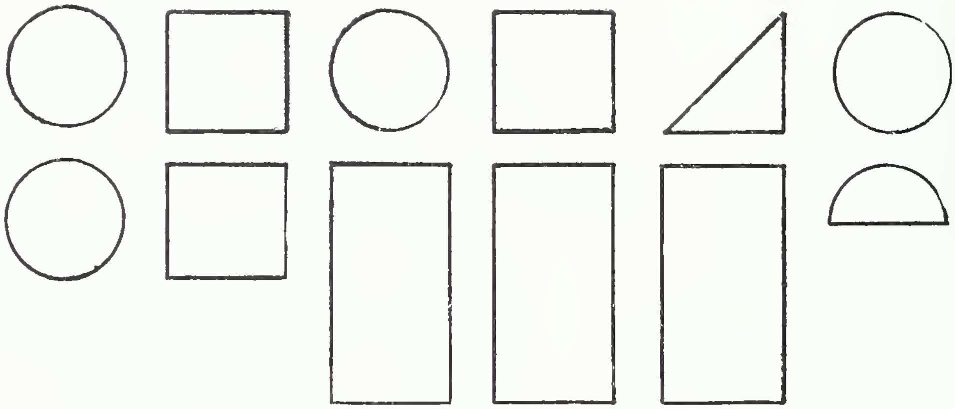
The diameters and diagonals of different figures can be easily and pleasantly taught to little children by paper-folding.

Paper-cutting, especially that of colored paper, is also a valuable accessory in the study of form and figure in primary work.

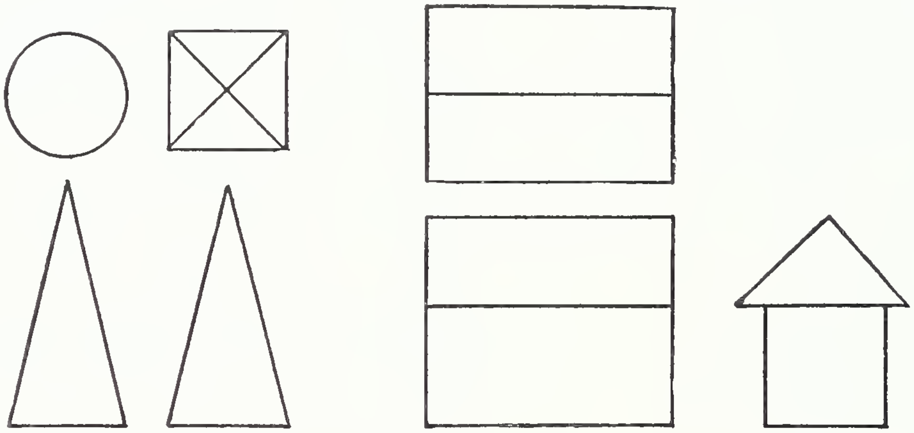
CONSTRUCTION

In *industrial construction*, the accurate presentation of the facts of objects is necessary, and drawing is used to convey ideas in regard to the facts of objects.

The sphere, cube, cylinder, square and triangular prisms are studied for a knowledge of all the facts of their forms as presented in the necessary geometric views. This knowledge is to be expressed by drawing the different geometric views in their relation to one another.



MODELS STUDIED AS TO THEIR FACTS AND THEIR RELATIONS



The applications of form-knowledge in industrial construction are of the utmost importance. The work here given in observing the facts of the models studied, and in expressing by drawing what has been observed, only needs the addition to the drawings of what are known as *conventions* such as centre-lines, working-lines, dimension-lines, etc., to be complete working-drawings.

In this course it has been deemed advisable to omit the presentation of these conventions.

REPRESENTATION

This subject deals with the general appearance of objects as wholes under the various conditions in which they may be placed with regard to the eye of the spectator.

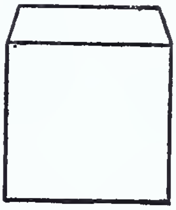
In this course the solids,— sphere, cube, cylinder and square prism — are studied as to their appearance as wholes in one position only, *i. e.*, when viewed in front of and below the eye.

For this work care should be taken not to place the models or objects too far below the eye.

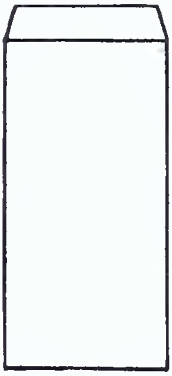
SPHERE.— There is no change in the appearance of the shape of the sphere, no matter how it may be viewed. The representation of the appearance of the sphere is always a circle.

CUBE.—Whenever a cube is placed below the eye, resting on one of its faces, so that two faces only are visible, the top face appears foreshortened and narrower than the front face.

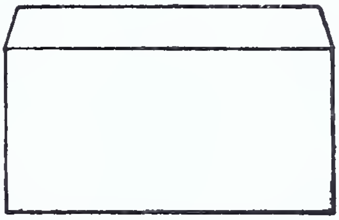
The farther edge of the top face appears shorter than the front edge, and the side edges appear to converge away from the front edge ; thus —



SQUARE PRISM.—Whenever a square prism is placed below the eye, resting on one of its faces so that two faces only are visible, the top face is foreshortened and the appearance of the solid is as follows :



ON ITS SQUARE FACE



ON ITS OBLONG FACE

CYLINDER.—When a cylinder is so placed that the edge of the top face is on a level with the eye, no part of the top face is seen and the curved edge appears as a straight line. When a cylinder is placed below the eye, resting on one of its plane faces, the circular face of the top is foreshortened and appears as an ellipse, and the breadth of the ellipse depends on the degree in which it is below the level of the eye.

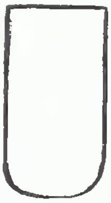


FIG. A

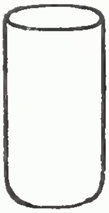


FIG. B

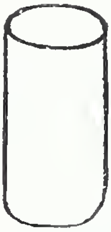


FIG. C

Fig. A : Cylinder, top face level with eye. Fig. B : Cylinder, top face a little below the eye. Fig. C : Cylinder, top face farther below the eye.

Note the change in the appearance of the lower curved edge as the distance below the eye increases.

DECORATION

This subject deals with the application of form-knowledge to the enrichment of industrial articles by beautifying their surfaces.

The ornamentation of an object must always be subordinate to the use of the object.

The elementary principles of arrangement for decorative purposes are symmetry, Figs. A, E ; repetition, Figs. B. C, and alternation, Figs. D, F.

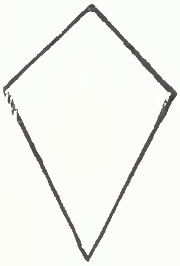


FIG. A

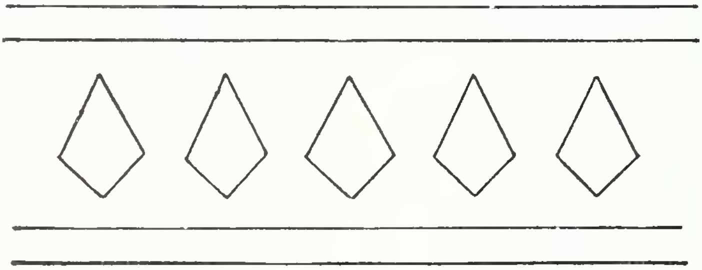


FIG. B

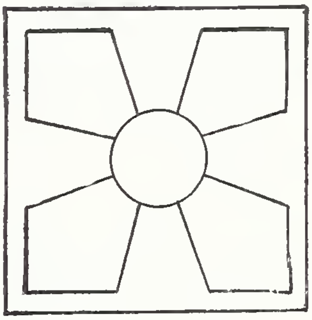


FIG. C

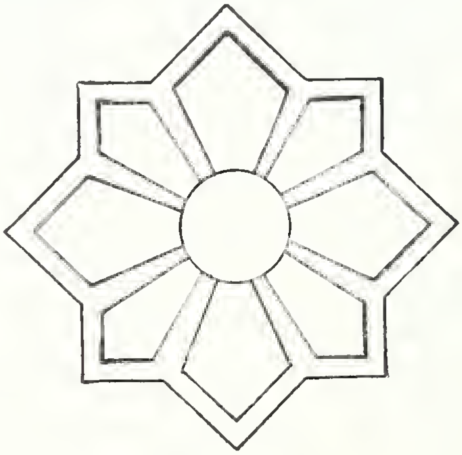


FIG. D

The modes of arrangement are, bi-symmetric figures, Figs. A and E borders, Fig. B; rosettes, Figs. C, D, G; surface-covering, Fig. F.

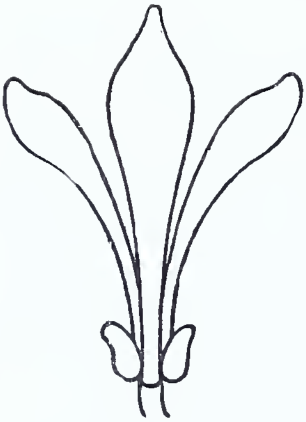


FIG. E

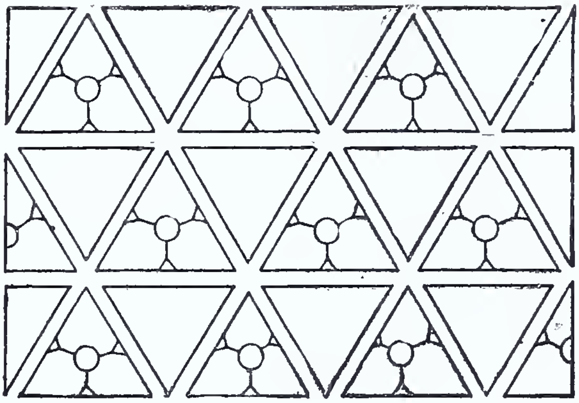


FIG. F

The sources from which materials for decorative design can be obtained are:

Geometric figures
Natural forms conventionalized
Historic ornament

Decorative designs should express strength, stability and repose.

In a rosette or central arrangement, the units should be held together by a central figure. The central figure should overlap the units, to express a firm union, Figs. C, D, G.

Units should not be joined by points, as such union expresses weakness, Figs. I, J.

A whirling effect should be avoided in a decorative design, as repose is thereby violated, Fig. H.

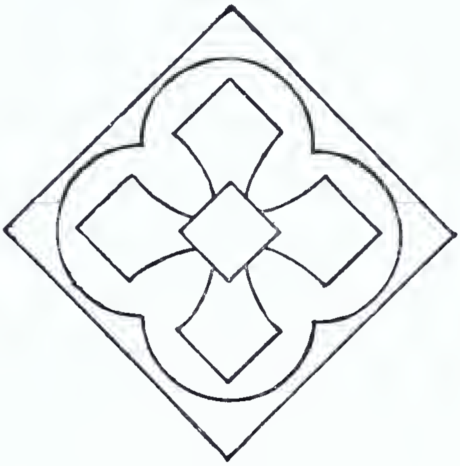


FIG. G

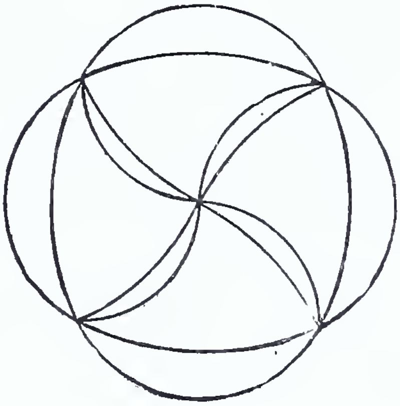


FIG. H

A decorative design should cover about two-thirds of the surface to be ornamented. If more space is covered, the design looks crowded; if less space is covered, the design looks insufficient.

All elementary decorative designs should be simple; a multiplicity of lines and small figures is wearisome. The following figures are given as illustrations of very bad arrangements, Figs. I and J.

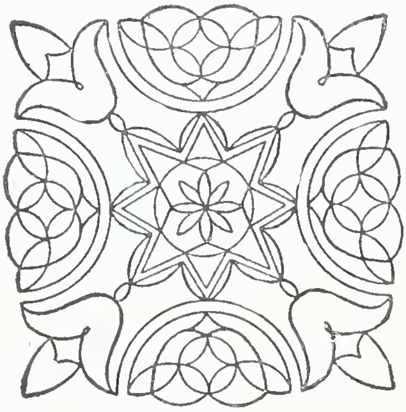


FIG. I

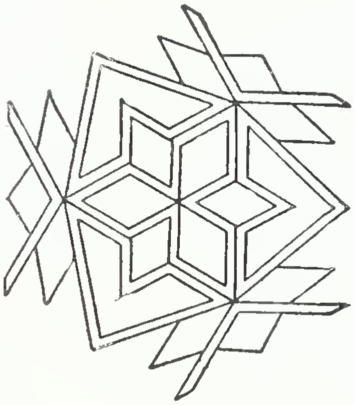


FIG. J

Colored paper may be used to great advantage in making decorative designs; but as the harmony of color requires much study, it is better not to attempt any combination of two or more positive colors in one design. Two tints of a color or two shades of a color may be used with good effect.

REVIEW

GENERAL OBSERVATIONS

Drawing is a language for the definite expression of form-ideas for various purposes. The development of form-ideas and a knowledge of the elementary principles of their practical applications, are the main points in the instruction. These form-ideas are to be derived from the study of type-forms and objects. Their applications should always be observed in objects.

Drill in drawing is for the training of the hand to express clearly form-ideas in their applications.

In this course there has been a study of only a few of the type-forms for the purpose of giving the general method to be pursued in gaining a knowledge of form. This form-knowledge has been shown to have applications in three directions:

1st In *industrial construction*, a subject which deals entirely with the facts of form in objects, and requires these facts to be clearly and accurately presented in their relation to one another.

2d In *pictorial representation*, a subject which deals with the appearance of objects as wholes, when viewed in different positions. This subject requires keen powers of observation, for the facts of objects undergo great modifications in appearance when viewed in different positions.

3d In *decoration*, a subject which relates to the enriching and beautifying of objects by the proper arrangement of forms and figures on their surfaces.

Only very elementary principles have been given in these three subjects. In drawing, the instruction has necessarily been limited to a few details as to method and character of work.

The aim has been to indicate to teachers the general character of work desired in the schools and on which the examinations will be based, with the expectation that teachers will pursue the subject farther and in accordance with the general course of study.

In the selection of objects to study, great care should be used to select only those that have beauty of form. In the study of decoration great care should also be taken to point out what is good and what is bad decoration. Teachers should endeavor to have their schools supplied with suitable models.

DEFINITIONS AND IMPORTANT FACTS

DIAMETER.— A straight line passing through the centre of a figure and terminating in opposite sides, and dividing the figure into two equal parts. The diameter of a square must be parallel to two of its sides.

DIAGONAL.— A straight line connecting opposite angles of a figure.

VERTEX.— The point of convergence toward which faces, edges or lines tend. The point in a figure farthest from the base.

BASE.— That part of a figure or form upon which it is assumed to rest.

ALTITUDE.— The distance from the base to the point farthest from the base, measured by a line perpendicular from that point to the base.

WORKING-DRAWING. — A drawing that gives all the facts of the form, size and structure of an object. It is a drawing by which a workman can manufacture an object.

FACTS OF FORM.— All details of form in their actual proportions and dimensions.

GEOMETRIC VIEW.— Such a view of an object as will show the facts of that portion visible to the observer. For a geometric view the eye of the observer is supposed to be directly opposite each point of the object that is visible in the view obtained.

FRONT VIEW.— A front view is that obtained when the object is directly in front of the observer on a level with the eye.

SIDE VIEW.— A side view is that obtained from a direction at right angles to that from which the front view is obtained. The object must be on a level with the eye. The right side view is the side view obtained from a position to the right of the observer's position for front view. A left side view is the side view obtained from a position to the left of the observer's position for front view.

BOTTOM VIEW.— The view obtained of an object when it is directly above the eye.

TOP VIEW.— The view obtained when an object is directly beneath the eye.

APPEARANCE OF FORM.— The aspect of that portion of an object visible to the observer at any one time. The appearance of an object varies with its position and its location in relation to the observer, and with its distance from him.

PROPORTION OF FORM.— The relative dimensions of the different portions of an object.

OUTLINE.— The apparent limitations of an object. The line that could be drawn around an object as it appears.

SYMMETRY.— The regular disposition of parts of an object or figure about a centre or about a straight line passing through the centre called an axis of symmetry.

RHYTHM.— The effect produced by the regular repetition at pleasing intervals of units in a decorative arrangement.

AXIS.— A straight line passing through the centre of a figure or object and dividing it into two parts that balance each other.

ROSETTE.— A decorative arrangement made by a regular repetition of units about a centre.

TREFOIL.— A figure containing equal portions of three circles regularly disposed about a centre.

QUATREFOIL.— A figure containing equal portions of four circles regularly disposed about a centre.

SYLLABUS No. 2

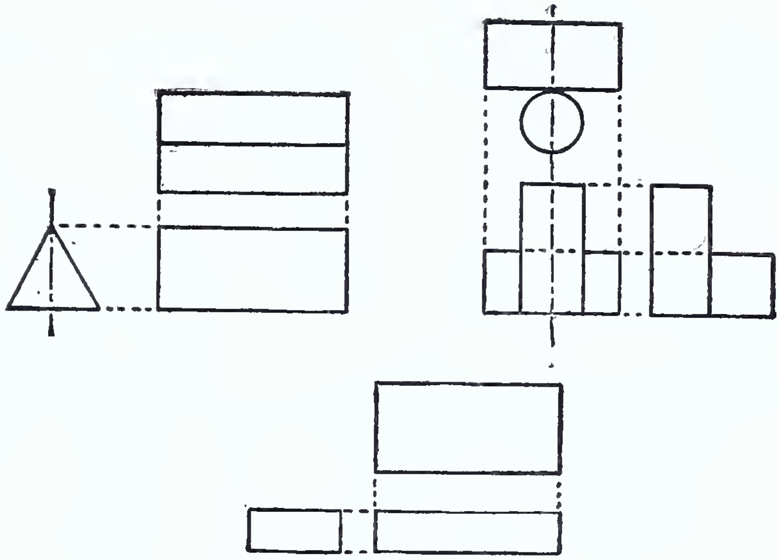
Form-study and Drawing

CONSTRUCTION

1 Short review of Syllabus No. 1. Constructive drawing showing three views.

2 Conventions used in making working drawings:
  a Centre line, dot and dash.
  b Lines connecting views, dotted.
  c Lines showing invisible edges or outlines, dash.
  d Figured dimensions.

3 Drawings showing combination of two objects:

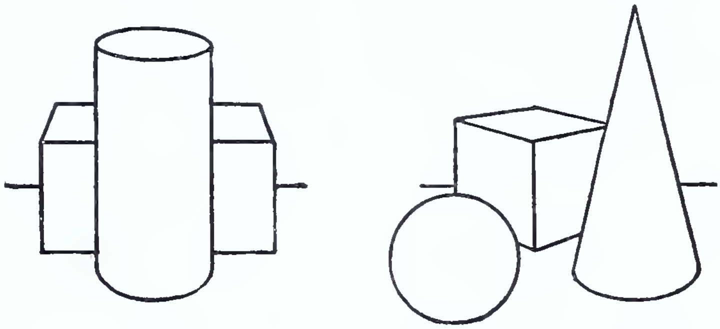


REPRESENTATION

4 Grouping of two or more objects.

5 Distance affects the apparent size of an object therefore in representing the appearance of two objects of the same size the farther one should be drawn smaller than the nearer one.

6 Two solids can not occupy the same space at the same time; therefore in representing two solids standing at the same level, care should be taken that their bases would not interfere with one another if they were wholly represented. If below the level of the eye, the nearer one should be placed lower in the picture than the farther one.



7 Parallel edges extending from the eye appear to converge, and if indefinitely prolonged would finally appear to meet.

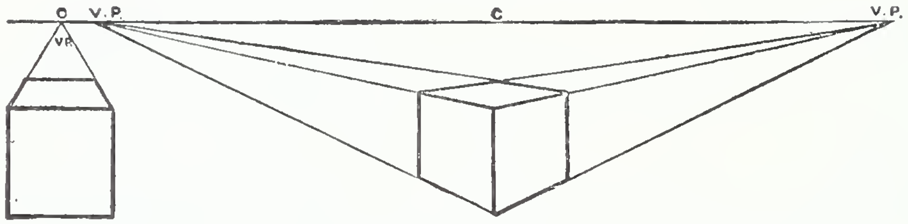
8 A point at which parallel retreating edges appear to meet is called a vanishing point.

9 As many vanishing points may be used in the representation of an object as there are sets of parallel retreating edges.

10 Retreating horizontal edges appear to meet their parallels on a level with the eye.

11 Edges extending directly from the observer appear to meet at a point opposite the eye. This point may be called the centre of vision.

12 Diagrams illustrating vanishing points:



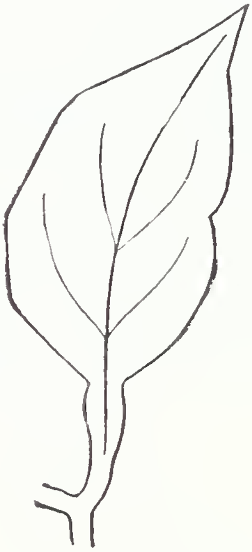
DECORATION

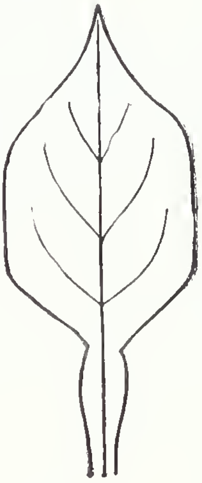
13 Conventionalization of natural forms for the purpose of ornamental design.

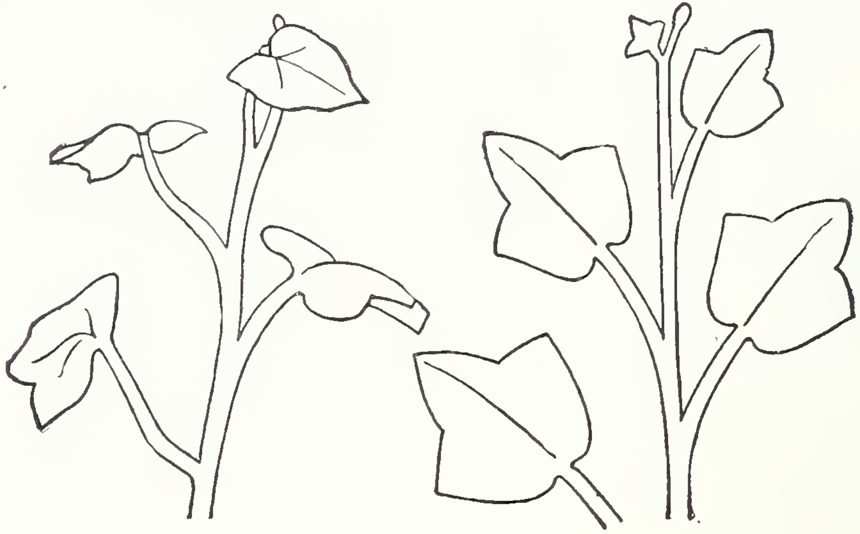
14 Representations of natural forms are not suited to the decoration of common objects, but conventional treatments of the same may be used for this purpose.

15 To conventionalize a natural form is to keep its general characteristics, omitting details.

ILLUSTRATIONS



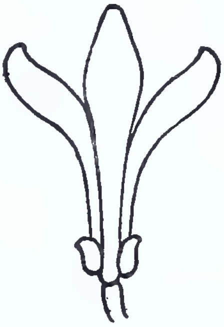


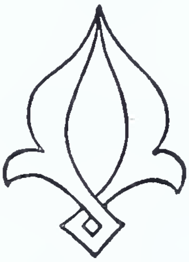


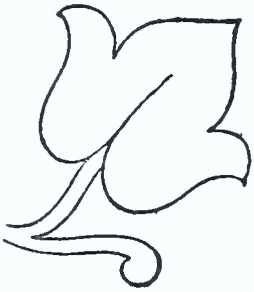
16 Historic ornament. The principles underlying the ornamentation of nations of the past should be studied in all our schools.

17 Students should at least become familiar with some of the simpler forms of beauty belonging to the best styles of historic ornament.

ILLUSTRATIONS







18 Art is the interpretation, not the imitation of nature.

APPENDIX 2

SUPPLEMENT TO ACADEMIC SYLLABUS

New York state history **Stenography**

New York state history.— The object of this study is to give students a more thorough knowledge of the history of the Empire state than it is possible to acquire in the limited time devoted to systematic instruction in United States history. The examination presupposes that students have pursued the subject for at least 20 weeks. Attention is directed to the introduction to the syllabus in United States history. The teacher should take advantage of local history and tradition in his endeavors to add interest to the following outline:

1 **Geography of New York.**—Mountain and river systems; navigable waters; influence of topography on settlement and development; natural resources.

2 **Aborigines of New York.**—Algonquins; Mohegans; Manhattans; Five Nations; character, institutions, habits and customs of each tribe; territory occupied by each; relations of different tribes.

3 **Discovery and settlement.**—Verrazzano, Cartier, Champlain, Hudson; Dutch West India Company; basis of Dutch claim to territory; extent of territory claimed; French expeditions into New York.

4 **Dutch government.**— Administrations of Minuit, Van Twiller, Kieft and Stuyvesant; relations with the Indians; introduction of slavery; popular representation in the government; the 12 men; patroons; character of the population; religion; education; manners and customs; causes of the decline of Dutch supremacy.

5 **English government.**— Capture of the province by the Duke of York; administrations of Nicolls and Lovelace; recapture by the Dutch; final cession to England; administrations of Andros, Dongan, Leisler, Sloughter; effects of revolution of 1688.

French in New York; basis of French claim to territory; French missionaries; relations with Indians; French invasions; New York expeditions against Canada; Queen Anne's war.

Growth of popular assembly; contests between governor and assembly; taxation of colony by England; growth of parties; influence of newspapers; Zenger libel case; Sons of Liberty; negro plot.

6 **New York during French and Indian war.**—Administration of De Lancey; Albany convention of 1754; Hendrick; French fortifications in New York; principal engagements of the war.

7 **New York during Revolution.** — Aggression of England; resistance in New York; first steps toward union with the other colonies; policy of non-importation; the liberty pole; the first bloodshed; the three parties; leaders of each; New York in colonial conferences; committee of 100; government during revolution; first state constitution; battles fought in New York; Indian and tory atrocities; Sullivan's expedition; treatment of prisoners by British; Benedict Arnold; Major André; evacuation of New York; supplies and men furnished by New York; revolutionary leaders of New York; treatment of tories.

8 **New York from the close of the Revolution.**—Condition of the colony at the close of the revolution; relative rank; attitude of New York toward the union; formation of parties; principal leaders; views of respective parties on ratification of constitution; organization of national government in New York; inauguration of Washington; the public lands; cession of territory by New York to the national government; part taken by New York in the war of 1812 · governors of New York and principal events in the administration of each; part taken by New York in the civil war; prominent statesmen, writers, philanthropists and in-

ventors; railways, canals and other internal improvements; development of agriculture, manufacture and commerce; organization and development of the common school system; the University of the State of New York; the Department of Public Instruction; normal schools; charitable and benevolent institutions; political parties in New York.

Stenography.—The examination consists of three tests as follows:

Ability to take down accurately in shorthand three selections dictated at the rate of 50, 75 and 100 words a minute respectively, and to transcribe the notes correctly either in longhand or on a typewriter.

Two counts will be allotted to the first and one count to each of the other tests. Candidates may take one, two or all of these tests at the same examination. Those who successfully complete the second test will be credited with the first; those who successfully complete the third test will be credited with the first and second.

Half an hour will be devoted to dictation of the selections, and two and one-half hours to transcription of the shorthand notes.

Three hours is the maximum for the examination. The time for dictation and transcription will be indicated in each of the three tests. The shorthand notes and the transcript are to be collected by the examiner at the close of the period assigned for each transcript.

Papers of candidates will be credited in proportion to the accuracy shown in taking down the selection or selections and in transcribing the notes.

APPENDIX 3

REGENTS' STUDIES AND CREDENTIALS

Suggested courses of study — Calendar 1891-1895 — Times, places, subjects and program of examinations

SUBJECTS IN WHICH REGULAR EXAMINATIONS ARE HELD IN ACADEMIES

Not a list of academic studies proper

This is not a list of academic studies proper, but a complete table grouped according to cognate relations of all subjects in which regular examinations are held to meet the varying needs dependent on locality, constituencies and special courses, of the 335 academies of the state. The appearance of so many subjects on this list should not be made an excuse for overcrowding the high school curriculum. Principals should not form classes in advanced subjects with immature pupils nor should they confuse with the regular high school course, subjects in which examinations are held or instruction is given for advanced or special students or those pursuing university extension courses.

Subjects may be withdrawn from list

The right is reserved to withdraw from the list of examinations offered, any subject in which less than 10 schools have given instruction during the previous year, but notice of such withdrawal will be sent to every school on or before the opening of the academic year on August 1.

Regents' studies

Explanation of type

Studies printed in **full-faced** type are those required for the English and classical diplomas. Subjects in *italics* are those in which examinations are held in June only; examinations in other subjects are held at times stated on p. 173.

Five groups of studies

GROUP 1

LANGUAGE AND LITERATURE

2 Reading
2 Writing
2 Spelling
2 English, elementary
2 English, advanced
2 English composition
2 Rhetoric
2 English literature
2 *American literature*
2 English reading
Special reading courses 1-6
  2 *English selections*
  2 *English prose*
  2 *English poetry*
  2 *American selections*
  2 *Ancient classics*
  2 *Modern foreign classics*
4 German, 1st year
4 *German, 2d year*
4 *German, 3d year*
4 French, 1st year
4 *French, 2d year*
4 *French, 3d year*
4 Latin, 1st year [a]
2 Cæsar's Comment.
1 *Sallust's Catiline*
2 Cicero's Orations
1 *Ovid's Metamorphoses*
3 Virgil's Æneid
1 *Virgil's Eclogues*
1 Latin composition
4 Greek, 1st year [a]
2 Xenophon's Anabasis
2 Homer's Iliad
1 Greek composition

GROUP 2

MATHEMATICS

4 Arithmetic
2 Arithmetic, advanced
4 Algebra
2 *Algebra, advanced*
3 Plane geometry
1 Solid geometry
1 Plane trigonometry

GROUP 3

SCIENCE

Physical

2 Astronomy
2 Physics
2 *Physics, advanced*
2 Chemistry
2 *Chemistry, advanced*

Geologic

2 Geology
2 Physical geography

Biologic

2 Botany
2 Zoology
2 Physiology and hygiene

GROUP 4

HISTORY AND SOCIAL SCIENCE

2 Geography
2 *General history*
1 Greek history
1 Roman history
2 English history
2 United States history
2 *New York history*
2 Civics
2 Economics

GROUP 5

OTHER STUDIES

2 *Psychology*
1 Ethics
2 *Stenography*, 50
1 *Stenography*, 75
1 *Stenography*, 100
Words per minute
2 Bookkeeping

Form-study and Drawing

2 Drawing
2 *Drawing, advanced*

Summary of subjects, branches and counts

SUMMARY

Subjects	Branches	Counts
English	16	32
German	3	12
French	3	12
Latin	8	15
Greek	4	9
Mathematics	7	17
Science	10	20
History, etc.	9	16
Other studies	8	13
Total	68	146

"Count" defined

NOTE.—The table assumes that each student takes three studies each day for five days each week. The term "count" represents 10 weeks' work in one of these studies. The figure prefixed to each subject shows how many counts are allowed that subject.

---

[a] In 1st year Latin and Greek, candidates may take the separate examination or defer it and receive six counts each for passing Cæsar and Anabasis examinations, which include the work of the first year. The separate examination is provided for those who may not study Latin or Greek after the first year, and for those who prefer to secure the four credits for 1st year's work and to take a separate examination in Cæsar or Anabasis rather than have six counts dependent on a single trial.

Examination in added studies in June

Added studies. — For the accommodation of advanced students; for schools having special courses; for candidates who have studied outside the academies; and for the increasing number beyond school age, who are pursuing university extension or other courses and wish to test their proficiency by the regents' standard, one examination will be held in June *in any other studies for which there shall be a reasonable demand.* These added studies count for all academic credentials exactly like those in the preceding list.[a]

Papers in added subjects will not be sent unless there are candidates

Applications from schools for papers in any of these added subjects must specify that there are candidates for examination or no papers will be sent till after examination week; i. e. the University will not break the seals of subjects in which perhaps there may be no candidates, simply to gratify curiosity as to what the questions may be, but will gladly send sample papers that have been already used in an examination.

Examinations may be taken in any order

Order of studies. — There is no restriction in the order in which studies may be taken. Advanced students who have come from other states, or who for other reasons, have not passed in elementary subjects may take them at any time: e. g. arithmetic after algebra or geometry; English composition after rhetoric, etc.

All credentials good till canceled for cause

Time limit. — There is no limit of time, but all credentials issued by the University are good till canceled for cause. (*See* Regents' Bulletin no. 4, page 208, rule 16.) Studies necessary to obtain any credential may be passed at different examinations.

Added subjects 1890-91

[a] During the academic year 1890-91, credits were assigned to and examinations held in the following added subjects, but these are not to be continued unless the demand shall warrant:

1 German literature
1 French literature
1 Conic sections
1 Spherical trigonometry
2 Analytical geometry
1 Surveying
1 Mineralogy
1 Biology
1 German history
1 French history
2 Pedagogy
2 History of philosophy
1 Logic
2 Art criticism
2 History of art

Medical subjects

Subjects in the professional group do not count for academic credentials and are not given in this list. Thus examinations in anatomy, physiology and hygiene, chemistry, surgery, obstetrics, pathology and diagnosis, therapeutics, practice and materia medica are held for the University degree of M. D., and for license to practice medicine in New York. A similar professional examination is held for law.

Library subjects

Also examinations are held in the library school connected with the state library in library student preliminaries, elementary bibliography, accession department work, elementary cataloguing, elementary dictionary cataloguing, elementary classification, shelf department work, loan systems, advanced bibliography, founding and government of libraries, library buildings, advanced cataloguing, advanced dictionary cataloguing, advanced classification, bookbinding, history of libraries, reading and literary methods, original bibliography.

UNIVERSITY CREDENTIALS

List of credentials with requirements

Credentials	Given for an attainment of 75 per cent in a regents' examination in
1 Pass card	Any regents' study
2 Preliminary (preacademic) certificate (14 counts)	Reading, writing, spelling, elementary English, arithmetic, geography
3 Medical student certificate (16 counts)	Spelling, elementary English, English composition, arithmetic, physics, geography, United States history, or any 20 counts, not including reading and writing
4 Law student certificate (19 counts)	English composition, 1st year Latin, arithmetic, geometry, English history, United States history, civics, or any 30 counts
5 Junior certificate (20 counts)	Preliminaries (see no. 2 above) and physiology and hygiene, United States history, drawing
6 Academic certificates	Any 30, 40, 50, 60, etc. counts

The number of counts that each subject represents, is given in the table of groups (page 160).

For *any* 30 counts, a 30-count certificate will be issued and for any 40, 50, etc. counts, a 40, 50, etc. count certificate will be issued. New certificates will be given whenever 10 additional counts are earned.

The 30 and 40-count certificates are issued as middle or senior English or classical certificates when the studies are those regularly taken in the English and classical courses, i. e.:

Middle English certificate	Junior studies (see no. 5) and algebra, physical geography, civics, bookkeeping
Middle classical certificate	Preliminaries (see no. 2 above) and English composition, 1st year Latin, Cæsar, algebra, physiology and hygiene, United States history
Senior English certificate	Middle English studies and English reading, geometry, physics, English history, ethics
Senior classical certificate	Middle classical studies and Cicero, 1st year Greek, geometry, Roman history

7 Academic diploma	Any 50 counts, if 14 are the preliminary, and of the remaining 36 not less than six are taken from each of the first three groups and six from groups 4 and 5 combined

Academic diplomas distinguished by name of subject specialized

As the academic diploma *requires* but six counts from any group, if earned by specializing largely in any group or language, the records of the office and the diploma itself will indicate this fact by qualifying the name "academic": e. g. if 12 or more counts are earned in Latin, the diploma will be distinguished as the *Latin* academic. While there is but one academic diploma, it may thus be distinguished, when one group or language is taken every term for three years (i. e. 12 counts) as an English, German, French, Latin, Greek, mathematical, scientific, or historical academic diploma. If 12 counts are thus earned in each of two or more groups, both distinguishing terms will be used: e. g. Latin-scientific, German-French, etc. This special distinction will not be granted unless at least 10 of the 12 counts are in advance of the preliminary branches.

8 English diploma (50 counts)

14 The six preliminary studies
2 English composition
2 English literature
2 Course in English reading
4 Algebra
3 Plane geometry
2 Physics
2 Chemistry
2 Physical geography
2 Botany
2 Physiology and hygiene
2 English history
2 United States history
2 Civics
2 Economics
1 Ethics
2 Bookkeeping
2 Drawing

9 Classical diploma (50 counts)

14 The six preliminary studies
2 English composition
4 Latin, 1st year
2 Cæsar's Comment., 4 books
2 Cicero's Orations, 6 orations
3 Virgil's Æneid, 6 books
1 Latin composition
4 Greek, 1st year
2 Xenophon's Anabasis, 3 books
2 Homer's Iliad, 3 books
1 Greek composition
4 Algebra
3 Plane geometry
2 Physiology and hygiene*
1 Greek history
1 Roman history
2 United States history

Advanced diplomas for holders of 50-count diplomas earning 10, 20, etc. additional counts

10 Advanced diploma. — This single diploma provides for all academic courses longer than the three regular 50-count courses covered by the academic, English and classical diplomas above. It is issued only to those who have earned one of the regular 50-count diplomas and 10, 20 or 30, etc. counts in addition. On its face are specified the original diploma on which it is based and also the total counts (which must be in even tens) that give it its name; e. g. one holding an English diploma and earning 20 extra counts could claim a "70-count advanced English diploma" instead of a 70-count certificate, which is less prized because it might be secured by one who had not taken a balanced course and had perhaps omitted entirely one or even two of the great groups of studies.

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* Students fitting for colleges which do not require physiology may substitute in the classical diploma two of the three following: Virgil's Eclogues, Ovid's Metamorphoses, Sallust's Catiline.

Classical scientific diploma (80-count) admits to State Normal College

A special form of the "80-count advanced classical diploma" has been prepared to cover the requirements for admission to the professional course of the New York State Normal College. It will be known as the "Classical-scientific diploma," and will be accepted by the college for admission to the professional class, which at the end of two years' successful study receives the degree bachelor of pedagogy. This requires a five and a half years' academic course and is designed for those unable to supplement their academic diploma with the regular four years' college course. It includes all the studies of the English and classical courses, and advanced English, advanced arithmetic, plane trigonometry and zoology.

Classical-scientific diploma (80 counts)

The six preliminaries	14 counts
Classical diploma	36 counts
English diploma, omitting 13 counts included in the classical	23 counts
^{2}Advanced English, ^{2}advanced arithmetic, ^{1}plane trigonometry, ^{2}zoology	7 counts
Total	80 counts

Or stated in a single list the required studies are:

14	The six preliminary studies
2	English, advanced
2	English composition
2	English literature
2	Course in English reading
4	Latin, 1st year
2	Cæsar's Comment., 4 books
2	Cicero's Orations, 6 orations
3	Virgil's Æneid, 6 books
1	Latin composition
4	Greek, 1st year
2	Xenophon's Anabasis, 3 books
2	Homer's Iliad, 3 books
1	Greek composition
2	Arithmetic, advanced
4	Algebra
3	Plane geometry
1	Plane trigonometry
2	Physics
2	Chemistry
2	Physical geography
2	Botany
2	Zoology
2	Physiology and hygiene
1	Greek history
1	Roman history
2	English history
2	United States history
2	Civics
2	Economics
1	Ethics
2	Bookkeeping
2	Drawing

Geology, with two years' German *or* two years' French, will be accepted in place of the 9 counts in Greek bracketed above and Greek history.

“Honors” for certificates and diplomas earned with 90 per cent in three fourths of required counts.

Honors.— When three fourths of all the counts for any certificate or diploma are won by at least 90 per cent or more, the credential will be recorded and marked as having been earned “with honor” and the annual report will show how many honor credentials have been issued to each school, with the names of recipients. Students who, after having taken some examinations, decide to compete for honors, will be allowed to take any subject over again for the purpose of raising their average standing

Subjects passed later may be indorsed on diploma

Indorsements. — Passcards are issued for any one or more branches passed, but diplomas and certificates will be issued only for the number of studies prescribed, which is always a multiple of 10. Those who secure diplomas will have the right to have studies passed later recorded on the back; but such indorsements will not be made on certificates. Thus, one holding a junior (20-count) certificate can get nothing but passcards in addition till a 30-count certificate has been earned.

By special request the added studies will be put on the face instead of on the back of diplomas which are to be framed.

Duplicate credentials issued for 25 cents each

Duplicate credentials.— These will be issued to replace lost or soiled originals on receipt of 25 cents each for the extra labor of looking up and verifying records. In case of students leaving the state or for other reasons wishing their latest passcards incorporated in a certificate, a duplicate including all subjects passed to date will be issued for the same fee.

Any certificate or diploma will be issued on application to any student whose record shows that he has passed all the subjects required for that credential, provided that he has not less than 10 new counts when he claims the new credential, even though other credentials may have been issued including a part of the same studies. (*See also page* 167, *foot-note.*) The University issues free, only the highest credential which the candidate has earned. If he wishes to complete a series by securing any lower credentials earned but not previously issued, he must pay a fee of 25 cents each the same as for duplicate credentials.

New credentials provide for record of: (1) subjects taken; (2) quantity; (3) quality

Summary.— The system of credentials now laid out provides for three distinct records: (1) subjects taken; (2) quantity; (3) quality; i. e. what has been studied, how much and how well. The English. academic and classical diplomas specify the subjects pursued. The 60-count, 70-count, etc. “advanced” diplomas specify extra quantity. The honor diplomas of every grade specify extra quality in the work done. Thus a regular English diploma shows the class of subjects taken, the quantity to be 50 counts, the quality to be 75 per cent or better. The "60-count advanced classical diploma with honor," shows the subjects taken to have been classical, that in quantity it was 10 counts more than the regular, and that in quality the standing was at least 90 per cent in three fourths of the subjects.

Summary of subjects from each group required for certificates and diplomas

NUMBER OF COUNTS FROM EACH GROUP

	Total counts	GROUP 1	GROUP 2	GROUP 3	GROUP 4	GROUP 5
		Language	Mathematics	Science	History	Other studies
Preliminary certificate	14	8	4	......	2	....
Medical student certificate	16	6	4	2	4	....
Law student certificate	19	6	7	......	6	....
Junior certificate	20	8	4	2	4	2
Middle certificate English	30	8	8	6	6	2
classical	30	14	8	2	4	2
Senior certificate English	40	8	11	8	10	3
classical	40	20	11	2	5	2
Academic diploma	50	14	10	6	8	....
English diploma	50	14	11	10	10	5
Classical diploma	50	31	11	2	6	....
Classical-scientific diploma	80	37	14	12	12	5

Grants determined by office record for each student

Allowance from academic fund for credentials.— For every pupil the office has a card on which is a complete record of all examinations passed and of all credentials issued. This determines what allowances shall be made from the academic fund.

Grants for credentials specified

Schools are allowed $5 for each junior certificate or higher academic credential issued, with $5 extra for the first diploma, and a second $5 extra for the first classical diploma issued to each student. This rule gives a premium for the balanced courses which lead to diplomas instead of certificates, as double payment, $10, is made for academic and English diplomas, and triple payment, $15, for classical and classical-scientific diplomas. The rule does not allow double premiums for the same studies; e. g. the holder of an English diploma can not claim an academic diploma for the same studies and get a second premium, as the extra $5 is only for the *first* diploma. The rules require 10 *new** counts, therefore a certificate can not be claimed for the same counts on which a diploma is issued. The school is thus apportioned $5 when the junior certificate is allowed, but not for any other 20-count certificate; $5 more for the 30-count; $5 more for the 40 count; and for 50 counts, $5 if a 50-count certificate is earned; $10 if an English or academic diploma is earned; $15 if a classical diploma is earned. Apportionment is made only on credentials actually issued, not counting duplicates. This gives credit for two or more credentials earned by the same student in the same year.

10 new counts required for each new certificate or higher credential

"Honor" credentials (for which three fourths of the counts must be earned by 90 per cent or more) receive no extra apportionment.

No extra grant for honor credentials

The advanced diplomas (of 60, 70, 80, etc. counts) get no extra apportionment above corresponding certificates, as the school has been paid for the original diploma with $5 for each 10 counts added.

Grants for advanced diplomas

These grants are made "for each sudent who has *during the last academic year* completed the examinations required" for each credential, provided that the claim is made before September 1.

Time limit

It is impossible to correct accidental omissions by a new grant, as the total balance, after paying for credentials, will have been already apportioned and paid to other academies on aggregate attendance. School officers must therefore make sure that their claims for all credentials earned during the academic year ending July 31, are filed in the University offices before September 1, when their right to make such claims expires by limitation. The school must take the risk of the mails and should hold the regents' receipt for its annual report as the only evidence that its claims will be included in the annual apportionment.

Omissions can not be corrected by new grant

Right to make claims expires Sept. 1

A credential earned by one who is not a regular student in the school where the examination is completed will be credited to that school unless the University shall for cause shown assign the credit otherwise.

Credential credited to that school where examinations were completed

Allowance from academic fund for attendance.— The balance of the fund is apportioned in proportion to the aggregate daily attendance of *academic* students in each academy.

Grants for attendance

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* This means 10 counts not required for the previous credential. A student with 47 counts could receive a 40-count certificate which would show that he had passed in all 47 counts. When he secured three more counts he would be entitled to a 50-count certificate, as seven of the preceding counts though recorded on the 40-count certificate were not required.

Academic student defined

1. The term "academic student" includes only those who:—
   - a. Have passed all preliminary or "preacademic" subjects.
   - b. Have become entitled to a 30-count certificate without passing all preliminaries.

2. Attendance of subacademic pupils must be recorded on a separate roll.

Tentative academic roll

3. Besides the academic and subacademic rolls, the office recommends a third or tentative academic roll on which students should be placed as soon as the required answer papers are passed by the principal, and attendance may be counted from the day after passing the last preliminary or the last subject necessary for a 30-count certificate, thus giving the school credit for the attendance between the examinations and the marking of the papers.

Three distinct rolls recommended

That is, there should be three distinct rolls:—
- a. An academic roll for those formally accepted by the Regents' office as of academic rank.
- b. A tentative roll for those who have been claimed by the principal, but not yet formally accepted by the Regents' office.
- c. A subacademic roll for all others.

Prompt examination returns

Claims may be made from June tentative roll

4. Returns from each examination will be sent before the next, so that principals may transfer to the permanent academic roll all students whose papers are not rejected on review at the Regents' office. As each institution must file its report before September 1, principals may add to their claims all who were placed on the tentative academic roll as the result of the June examinations and who attended the regular exercises for one day or more after passing the last required subject. If on review the answer papers of any scholar so included are rejected, the claim for his attendance will be canceled at the Regents' office and his name must be replaced on the subacademic roll.

Attendance defined

5. Academic students present during at least one regular school exercise may be counted as having attended for the day, no deduction being made for tardiness or absence from a part of the exercises.

Attendance not counted unless school is in session

6. Attendance is not to be counted unless the school is actually in session; e. g. attendance during regents' examinations may be counted regardless of the number of examinations taken by the student reported, but holidays, institute week, etc. are not to be counted unless the school remained in session.

Basis for apportionment

7. The total attendance copied from the academic and the June tentative rolls (*see 4 above*) and sworn to by the officers of the school will be the sole basis for apportionment from the academic fund for attendance.

SUGGESTED ARRANGEMENT OF STUDIES REQUIRED FOR ENGLISH DIPLOMA

	1st quarter	2d quarter	3d quarter	4th quarter
1st year	United States history Drawing Algebra	United States history Drawing Algebra	Civics Physiology and hygiene Algebra	Civics Physiology and hygiene Algebra
2d year	Bookkeeping Physical geography Geometry	Bookkeeping Physical geography Geometry	English reading Physics Geometry	English reading Physics Ethics
3d year	English history Chemistry English composition	English history Chemistry English composition	Economics Botany English literature	Economics Botany English literature

SUGGESTED ARRANGEMENT OF STUDIES REQUIRED FOR CLASSICAL DIPLOMA

	1st quarter	2d quarter	3d quarter	4th quarter
1st year	Latin lessons	Latin lessons	Latin lessons	Latin lessons
	United States history	United States history	Physiology and hygiene	Physiology and hygiene
	Algebra	Algebra	Algebra	Algebra
2d year	Cæsar	Cæsar	Cicero's Orations	Cicero's Orations
	Greek lessons	Greek lessons	Greek lessons	Greek lessons
	Geometry	Geometry	Geometry	Roman history
3d year	Virgil's Æneid	Virgil's Æneid	Virgil's Æneid	Latin composition
	Anabasis	Anabasis	Homer's Iliad	Homer's Iliad
	English composition	English composition	Greek history	Greek composition

TIMES OF REGENTS' EXAMINATIONS

Regular examinations are held in January and June in all regular academic studies, and in others for which there has been a reasonably large demand.

All regular academic studies in January and June

The scheme of examinations is based on a school year of 40 weeks, divided into two half years, semesters, or terms of 20 weeks each. The regular examinations are held during the 20th and 40th weeks from the second Monday in September, counting the week beginning with the second Monday in September as 1. As most schools begin the first Monday in September, this allows a week's recess at Christmas; others take a longer recess and shorten the term.

System based on school year of 40 weeks

Special examinations are held in September for law and medical students only, and in November and March to accommodate schools that have not changed from three 13-week terms to two 20-week terms each year.

Law and medical student examinations in September

Some schools think it an advantage to have the privilege of a third examination, and while approving two examinations a year as a better educational method, hesitate to put themselves at a disadvantage as compared with schools which obtain permission to hold three. Therefore, as long as question papers are made in November and March for schools which ask the privilege of examinations at these times, schools adopting the regular examinations in January and June may be permitted, for sufficient cause, to take the subjects in November *or* March; but schools given permission to take November *and* March examinations forfeit their claim to examinations in January.

Two *vs.* three examinations yearly

No school, under any circumstances, is entitled to more than three examinations during the same academic year.

Only three examinations yearly

No school is entitled to the September examination, which is for law and medical students only.

September examination

No school has yet been required to hold any examination.

Examinations optional

From an educational standpoint the University strongly favors two regular examinations annually instead of three, as is shown by the following:

University favors two examinations yearly

EXTRACT FROM MINUTES OF REGENTS' MEETING, HELD JULY 10, 1889

"The results of the inquiry made throughout the state as to the desirability of having two instead of three regents' examinations annually were submitted in tabular form and discussed. The evidence collected clearly called for two examinations as most useful to the majority. The peculiar circumstances of some schools seemed, however, to require for the present a continuance of the old system. In order to meet the wants of all, it was

Resolved, That hereafter two instead of three regular regents' examinations be held each year, but that in any school submitting satisfactory evidence that its best interests require three, the office be authorized to hold, for the present, three examinations a year."

November and March examinations continued

Under this authority, and after a year's experience, showing that the chief difficulty that prevents the adoption of the regular examinations in January and June arises from the fact that in many schools certain classes of pupils leave school in November and March, and hence are much better accommodated by special examinations in these months, it is decided to continue these special examinations in all subjects which are often needed by these winter pupils.

Schools advised to take January and June examinations

Schools are strongly advised to take the regular examinations, but the office will accept as the "satisfactory evidence" required by the ordinance, above quoted, the following statement, duly signed by the principal and by an officer of the trustees authorized to do so by a majority vote at a legal meeting. Unless this statement is filed in the Regents' office by October 1, the school will be registered as taking the regular January and June examinations only.

"The trustees and principal of ...., after full consideration of the reasons given in Regents' Bulletin no. 4 for holding only the regular examinations, are convinced (without regarding the consideration of passing pupils who have failed in former examinations, or the influence of the examinations on the share of the school in the apportionment of the academic fund) that the best educational interests of this school will be served by holding in it the special regents' examinations in ...."

Calendar for 1891-95

CALENDAR OF REGENTS' EXAMINATIONS

For the academic years 1891–1895

Year	September	November	Year	January	March	June
1890	23–25	18–20	**1891**	19–23	4– 6	8–12
1891	22–24	23–25	**1892**	25–29	14–18	13–17
1892	27–29	21–23	**1893**	23–27	13–17	12–16
1893	26–28	27–29	**1894**	22–26	12–16	11–15
1894	25–27	26–28	**1895**	21–25	11–15	10–14

TIMES, PLACES AND SUBJECTS OF ACADEMIC EXAMINATIONS

Law and medical students are admitted to all examinations. Academic students are admitted to all except the September examinations, which are for law and medical students only.

TIMES	PLACES	EXAMINATIONS IN			
		Group 1, Language		Group 2, Mathematics Group 3, Science	Group 4, History and social science Group 5, Other studies
		Modern	Ancient		
September — The last Tuesday, Wednesday and Thursday For law and medical students only	New York, Brooklyn, Albany, Syracuse, Buffalo	Reading Spelling English, elementary " composition	Latin, 1st year	Arithmetic Plane geometry Physics	Geography English history United States history Civics
November — Monday, Tuesday and Wednesday of Thanksgiving week	New York, and about 160 academies and high schools	Reading Writing Spelling English, elementary " composition " literature	Cæsar's Comment.	Arithmetic Algebra Plane geometry Physics Physical geography Physiology and hygiene	Geography Greek history English history United States history Civics Economics Bookkeeping Drawing
January * — 20th week from second Monday in September	New York, and about 200 academies and high schools	January and March * Reading Writing Spelling English, elementary " advanced " composition Rhetoric English literature " reading German, 1st year French, 1st year	Latin, 1st year Cæsar's Comment. Cicero's Orations Virgil's Æneid Latin comp. Greek, 1st year Xenophon's Anab. Homer's Iliad Greek comp.	Arithmetic " advanced Algebra Plane geometry Solid geometry Plane trigonometry Astronomy Physics Chemistry Geology Physical geography Botany Zoology Physiology and hygiene	Geography Greek history Roman history English history United States history Civics Economics Ethics Bookkeeping Drawing
March * — Week beginning second Monday	New York, and about 160 academies and high schools				
June — 40th week from second Monday in September	New York, and about 375 academies and high schools	Same as in January and March, and American literature Reading courses 1 6 German, 2d year " 3d year French, 2d year " 3d year	Sallust's Catiline Ovid's Metamorpho. Virgil's Eclogues	Algebra, advanced Physics, advanced Chemistry, advanced	General history New York history Psychology Stenography Drawing, advanced

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* Examintions in psychology, second and third year French and German will be given in January. Examinations in New York history and advanced drawing will be given in March. Schools not regularly taking examinations in January or March may take the examinations in these subjects.

DAILY PROGRAM OF REGENTS' EXAMINATIONS

The oral examination in reading may be held any time during examination week at the convenience of the examiner.

SEPTEMBER 12 SUBJECTS

September examinations are for law and medical students only.

Tuesday	Wednesday	Thursday
9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m.
Arithmetic	English, elem. Plane geometry	U. S. history
1:15-4:15 p. m.	1:15-4:15 p. m.	1:15-4:15 p. m.
Geography Civics	Spelling Eng. comp.	Latin, 1st year Physics Eng. history

NOVEMBER 21 SUBJECTS

Monday	Tuesday	Wednesday
9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m
U. S. history	Arithmetic Greek history	Writing English, elem. Algebra Plane geometry Drawing
1:15-4:15 p. m.	1:15-4:15 p. m.	1:15-4:15 p. m.
Cæsar Physics Eng. history Bookkeeping	Phys. geography Geography Civics Economics	Spelling Eng. comp. Eng. literature. Phys. and hygiene

JANUARY 49 SUBJECTS

Monday	Tuesday	Wednesday	Thursday	Friday
9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p. m.	9:15 a. m.-12:15 p.m.	9:15 a. m.-12:15 p. m.
French, 2d year French, 3d year Arithmetic, adv.	Rhetoric Arithmetic Botany Greek history Ethics	Writing English, elem. Algebra Plane geometry Chemistry Drawing	German, 1st year Greek, 1st year Greek comp. Trigonometry U. S. history	Xenophon's Ana. Homer's Iliad Roman history Psychology
1:15-4:15 p. m.	1:15-4:15 p. m.	1:15-4:15 p. m.	1:15-4:15 p. m.	1:15-4:15 p. m.
English, adv. German, 2d year German, 3d year	Virgil's Æneid Phys. geography Geography Civics Economics	Spelling Eng. comp. Eng. literature Astronomy Zoology Phys. and hygiene	French, 1st year Latin, 1st year Cæsar Physics Eng. history Bookkeeping	English reading Cicero's Orations. Latin comp. Solid geometry Geology

MARCH 46 SUBJECTS

Monday	Tuesday	Wednesday	Thursday	Friday
9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p.m.
Arithmetic, adv. Drawing, adv.	Rhetoric Arithmetic Botany Greek history Ethics	Writing English, elem. Algebra Plane geometry Chemistry Drawing	German, 1st year Greek, 1st year Greek comp. Trigonometry U. S. history	Xenophon's Ana. Homer's Iliad Roman history New York history
1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.
English, adv.	Virgil's Æneid Phys. geography Geography Civics Economics	Spelling Eng. comp. Eng. literature Astronomy Zoology Phys. and hygiene	French, 1st year Latin, 1st year Cæsar Physics Eng. history Bookkeeping	English reading Cicero's Orations Latin comp. Solid geometry Geology

JUNE ALL SUBJECTS

Monday	Tuesday	Wednesday	Thursday	Friday
9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p. m.	9:15 a. m.–12:15 p.m.	9:15 a. m.–12:15 p.m.	9:15 a. m.–12:15 p. m.
French, 2d year French, 3d year Virgil's Eclogues Arithmetic, adv. Algebra, adv. Drawing, adv.	Rhetoric Reading course 1 Arithmetic Botany Greek history Ethics	Writing English elem. Reading course 3 Algebra Plane geometry Chemistry Drawing	American lit. Reading course 5 German, 1st year Greek, 1st year Greek comp. Trigonometry Stenography U. S. history	Xenophon's Ana. Homer's Iliad General history Roman history New York history Psychology
1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.	1:15–4:15 p. m.
English, adv. German, 2d year German, 3d year Sallust's Catiline Ovid's Metamorph. Physics, adv. Chemistry, adv.	Reading course 2 Virgil's Æneid Phys. geography Geography Civics Economics	Spelling Eng. comp. Eng. literature Reading course 4 Astronomy Zoology Phys. and hygiene	Reading course 6 French, 1st year Latin, 1st year Cæsar Physics Eng. history Bookkeeping	English reading Cicero's orations Latin comp. Solid geometry Geology

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